AF-IAST
Skilling Pakistan

PAK-AUSTRIA FACHHOCHSCHULE:
INSTITUTE OF APPLIED SCIENCES AND TECHNOLOGY

A PROJECT OF THE KPK GOVERNMENT

PARSE

Research Magazine

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PAF-IAST Research in Applied Sciences and Engineering

CONTENTS

1.	Message from the Rector	07
2.	Research and Innovation Concept of PAF-IAST	09
3.	Research Labs at PAF-IAST	12
	• Genomics Lab	14
	• Microbiology Lab	14
	• Endocrinology and Translational Medicine Lab	14
	• Assisted Reproductive Technologies & Medicine	14
	• Drug Discovery, Drug Repurposing and Bio signaling	14
	• Biomaterials and tissue engineering lab	15
	• Cell Culture & Stem Cells lab	15
	• Microscopy Lab	15
	• Fluorescence-Activated Cell Sorting	15
	and Analyzer (Facs) Lab	15
	• Membrane Technology Lab:	15
	• Air Quality Monitoring Lab	15
	• Water and Wastewater Quality Testing Lab:	15
	• Biofuel Production Lab	15
	• Material Synthesis Lab	17
	• Catalysis Lab	17
	• Engineering Mechanics & Mechanical Testing Lab	17
	• Heat Treatment Lab	17
	• Fish Innovation Lab	17
4.	Centers Of Excellence PAF-IAST	18
5.	Funded Projects	28
6.	Faculty Trainings	42
7.	Research Productivity	44
8.	Research Products	66
9.	Seminars, Conferences and Workshops	70
10.	Linkages And Collaboration	72

MESSAGE FROM THE RECTOR

As the first Rector of Pak-Austria Fachhochschule Institute of Applied Sciences and Technology (PAF- IAST), I couldn't be more excited about the impact this institution will have on Pakistan's economy. At PAF-IAST, we are committed to providing our students with a world-class education that combines theoretical knowledge with practical skills, so they can hit the ground running when they start their careers. Our vision is to be the premier institution for applied sciences and technology education in Pakistan by providing our students with the skills and knowledge they need to succeed in their chosen fields.

Our mission is to deliver a high-quality education that prepares our students for the real world. We believe that practical experience is just as important as theoretical knowledge and that is why we put a strong emphasis on providing hands-on training and internships to our students. Our goal is to provide our students with the skills and knowledge that are in high demand in the job market, so they can be successful in their chosen careers.

We also place a strong emphasis on research, innovation, and entrepreneurship. We encourage our students to think creatively, explore new ideas and solve real-world problems. We have a dedicated team of experts who provide guidance, mentorship, and support to our students in all aspects of research and innovation.

PAF-IAST is continuously engaged with the industry. We have a vibrant culture of industry partnership; this helps us to understand the industry demands and align our curriculum accordingly so that our graduates are industry ready and have the required skills.

At the heart of PAF-IAST is the Technology Park, an innovation hub built to promote new start-up companies with close ties to the Austrian, Chinese, and Pakistani industries. The emphasis will be on applied research of industrial importance, with the goal of fostering the development and manufacture of innovative products both for the local market of Pakistan and for export.
I would like to invite all of our students, faculty, and staff to actively participate in the life of our institution. Your ideas and suggestions are always welcome, and we encourage you to take advantage of the many opportunities we offer for professional development and personal growth.

Thank you for choosing PAF-IAST, and I look forward to working together to make our institution an even better place to learn, work, and grow.

Prof. Dr. Mohammad Mujahid
Rector
Pak-Austria Fachhochschule Institute of Applied Sciences and Technology (PAF-IAST)

RESEARCH AND INNOVATION CONCEPT OF PAF-IAST

Pak-Austria Fachhochschule: Institute of Applied Sciences and Technology (PAF-IAST), founded in 2019, is a unique concept and a quantum leap forward in the fast burgeoning, knowledge-based economy far beyond a mere educational structure. It is an unprecedented initiative with focus on the promotion of research, innovation, and entrepreneurship with a Lab to Market concept thus becoming a model, to promote entrepreneurial eco-system for knowledge-based economy through high-tech research labs, incubators, innovative café, and a center for professional development and consultancy. PAF- IAST has self-assured to take up the challenge to produce at least one commercializable research-based novel product a year thus promoting innovation and entrepreneurship rather than merely conventional teaching and basic research.

The Office of Research Innovation & Commercialization (ORIC) is responsible to coordinate all the research activities and translation of research into economic growth. It establishes linkages between researchers, industries, government institutions, funding agencies, intellectual property offices, and all stakeholders who join hands for the prosperity & betterment of society. The PAF-IAST has developed an industry-focused curriculum to produce skilled professionals and a strong linkage with the local industry is built already. The skills and knowledge are provided to the students and faculty to become an innovative, opportunity-driven, and entrepreneurial manager(s), which is the spirit of the Lab to Market concept. The PAF-IAST teaching is specially focused on how to generate scalable new ideas that fulfill a market need and have a positive impact on the socio-economic situation of the society.

The Institute is not only providing technical support but a hefty amount of funds is already set aside to provide financial support for applied research and building of new startups to foster entrepreneurial culture. The PAF-IAST built a multistory technology park building, where all the start-ups will be located, and this will be the heart of “Lab to Market” activities. The PAF-IAST will change the trends of research culture in Pakistan from scholarly publications to the products hence the dream of a knowledge-based economy in Pakistan will come true.

PAF-IAST has envisaged a comprehensive plan for providingintellectual platform that includes an Innovation Technology Park (ITP) for the indigenous research and development of export-oriented technology solutions. PAF-IAST holds a strategic position as an Industrial special economic zone (SEZ) having accessibility to a nearby dry port in Havellian, in Hattar, whereas PAF-

IAST is just 3 km off the CPEC Hazara motorway while technology clusters to be developed are within the vicinity will have high demands of skilled human capital and knowledge infrastructure.

All of this work aims to build on Pakistan's existing industries by incorporating new technologies in order to develop and foster next-generation products and processes in line with the fourth industrial revolution, as well as to create jobs through start-up support.

INTELLECTUAL PLATFORM BY PAF-IAST

It is worth mentioning that inventions alone are not innovations; Innovation is the result of a passionate painstaking roller coaster journey of research that results in a commercializable end product employing new technologies. Conventional route for dissemination of new knowledge as a result of basic research includes; traditional publications and generating intellectual property that may lead to a business case establishing a company.

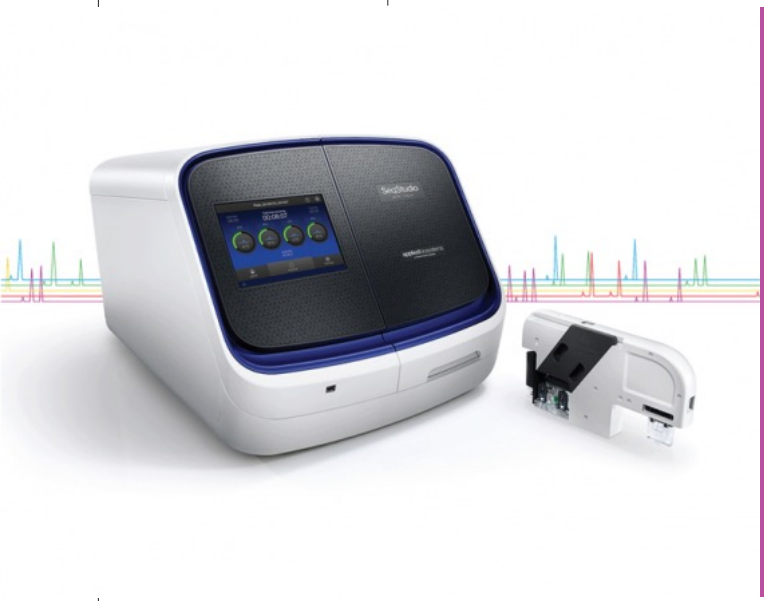
Alternately, in an entrepreneurial world knowledge is disseminated by transforming new knowledge into a valuable commodity as a result of academic exercise by researchers that commercialized through academic entrepreneurship. In academia, the usual challenge faced by faculty and researchers is their bench-scale proof of concept discovery in the laboratory, which leads to recognition, immature discovery is unfortunately not convincing enough for commercialization. Appreciating the missing link, academics have comprehended the importance of embryonic academic entrepreneurship which involves much more effort to transform an invention into innovation. it is all about the cross-fertilization of notions and the manifestation of opportunities.

FUNDED RESEARCH AT PAF-IAST

Faculty is encouraged to establish close liaisons with industries and find avenues to commercialize their research. They are supported to work on projects which are applied in nature and market-driven. A start-up grant is planned to award to faculty as a seed fund for their research projects which makes business sense. Using this fund, faculty can create opportunities for the students in their respective disciplines of knowledge. Faculty is encouraged to establish their startups under the umbrella of ITP. The financial constraints are reduced so that faculty can whole heartedly work on the commercialization of their products, processes & technologies.

RESEARCH LABS AT PAF-IAST

PAF-IAST has a robust vision to work on the cusp of innovative science, therefore the constituent faculties and programs regularly collaborate internally as well as externally in individual and joint projects to move forward. Considering the importance of research in sectors such as healthcare, agriculture, conservation, sustainability, IT and CS, Chemical and mineral Engineering, energy, etc, the departments have established specialized research Labs to provide solutions to our societal problems. These Labs and their corresponding significance is as follows:



STATE OF THE ART RESEARCH LABS

GENOMICS LAB

The Genomics lab established at PAF-IAST will be a hub for conducting research in oncology, genetic disease testing, non-invasive prenatal testing, pharmacogenetics and more.

MICROBIOLOGY LAB

Microbiology laboratories have all the facilities to conduct research on plant diseases that are caused by bacteria, fungi, viruses, algae, and protozoa. In diagnostics, this lab is used to confirm the occurrence of infectious diseases and to identify etiological agents.

HISTOPATHOLOGY & IMMUNOHISTOCHEMISTRY

Histopathology is the science of visualizing pathological features of tissue with the help of various tissue processing, staining and microscopic techniques. PAF-IAST, histology laboratory is well-equipped to perform basic and advanced procedures of histopathology.

ENDOCRINOLOGY AND TRANSLATIONAL MEDICINE LAB

This lab is equipped with state-of-the-art equipment to study hormones, assays to measure various hormones, and to take the scientific discoveries from the laboratory to the field or clinical setting.

ASSISTED REPRODUCTIVE TECHNOLOGIES & MEDICINE

The Assisted Reproductive Technologies and Medicine Laboratory is equipped with state-of-the-art equipment to develop cost-effective molecular diagnostics kits for infertility and efficient fertility therapy.

DRUG DISCOVERY, DRUG REPURPOSING AND BIOSIGNALING

State of the art research laboratory at PAF-IAST offers the identification of potential new therapeutic candidates and molecular attestation of

bio-signaling induced by drugs and their clinical screening in various neuropsychiatric disorders.

BIOMATERIALS AND TISSUE ENGINEERING LAB

The Biomaterials and tissue engineering lab is equipped with 3-D Bioprinter (1st in Pakistan) and many other equipments. It is established to acquaint students with an experience of conventional 2D and 3D mammalian cell culture systems.

CELL CULTURE & STEM CELLS LAB

This lab is a part of the biomaterials and tissue engineering lab, where all the facilities are available to perform culturing of different types of cells and stem cells in sterile conditions.

MICROSCOPY LAB

Microscopy Lab is a common resource offering comprehensive light, florescence, and confocal microscopy technologies.

FLUORESCENCE-ACTIVATED CELL SORTING AND ANALYZER (FACS) LAB

This lab is equipped with a fluorescence-activated cell sorter (FACS) which capitalizes on a technique to separate specific cell populations based on phenotypes detected by flow cytometry.

MEMBRANE TECHNOLOGY LAB

PAF-IAST Membrane Technology Lab offers a unique ability to permeate specific solute components pass through it but also for gas and vapor separations and to exploit it for several applications such as CO2 separation, water purification, water desalination, and different environmental aspects.

AIR QUALITY MONITORING LAB

Air pollution is one of the big challenges faced around the globe. To monitor the quality of air and control air pollution by testing air quality for conducting tests outdoor and indoor.

WATER AND WASTEWATER QUALITY TESTING LAB

Water and wastewater quality testing lab is a lab where measurement and treatment methods of water and wastewater are being taught by introducing them to various testing and treating devices.

BIOFUEL PRODUCTION LAB

In our biofuel production lab, biofuels like biogas, bio diesel, and bio ethanol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plants are placed to practice the conversion of waste into energy. In our bio lab nanoparticles in different shapes with focus on a variety of applications in energy conversion, medicine and electronics are developed.

MATERIAL SYNTHESIS LAB

Equipment and facilities for material synthesis for catalytical studies are readily available in the Material Synthesis lab at C&EE.

CATALYSIS LAB

This lab is developed for surface chemistry studies related to heterogeneous catalysis, electrocatalysis, and photocatalysis through experimental rate measurements, spectroscopy, and adsorption measurements.

ENGINEERING MECHANICS & MECHANICAL TESTING LAB

The engineering mechanics & mechanical testing lab is designed to demonstrate to students the basic principles of Engineering Mechanics, namely, Engineering Statics, Engineering Dynamics, and Mechanical testing.

HEAT TREATMENT LAB

The purpose of this lab is to determine how different types of heat treating would affect a metal's mechanical properties by changing the microstructure at different temperatures and treatments.

FISH INNOVATION LAB

PAF-IAST has a small water reservoir and a dam on campus where different types of fish are grown. Fish research is a neglected area in Pakistan though fisheries can be utilized to alleviate poverty and improve nutrition in Pakistan's populations. After identification of this area, the Institute is keen to establish a "Fish Innovation Lab" where to utilize fish culture technologies and biotechnological techniques to improve fish production.

CENTERS OF EXCELLENCE AT PAF-IAST

CENTERS OF EXCELLENCE AT PAF-IAST

PAF-IAST is a multi-faceted initiative that aims to create and establish additional Centers/Schools of excellence that are demand-driven and geared towards meeting the needs of the industry and ensuing economic development that is foreseen in the background scenario of the -China-Pakistan Economic Corridor (CPEC). Keeping in view the new avenues and significance of CPEC, PAF-IAST is establishing 04 Centers of excellence with the co-operation of China, solely geared towards the provision of skills concerned with:

1. Railway Engineering;
2. Agriculture Food Technologies;
3. Mineral Resources Engineering; and
4. Artificial Intelligence

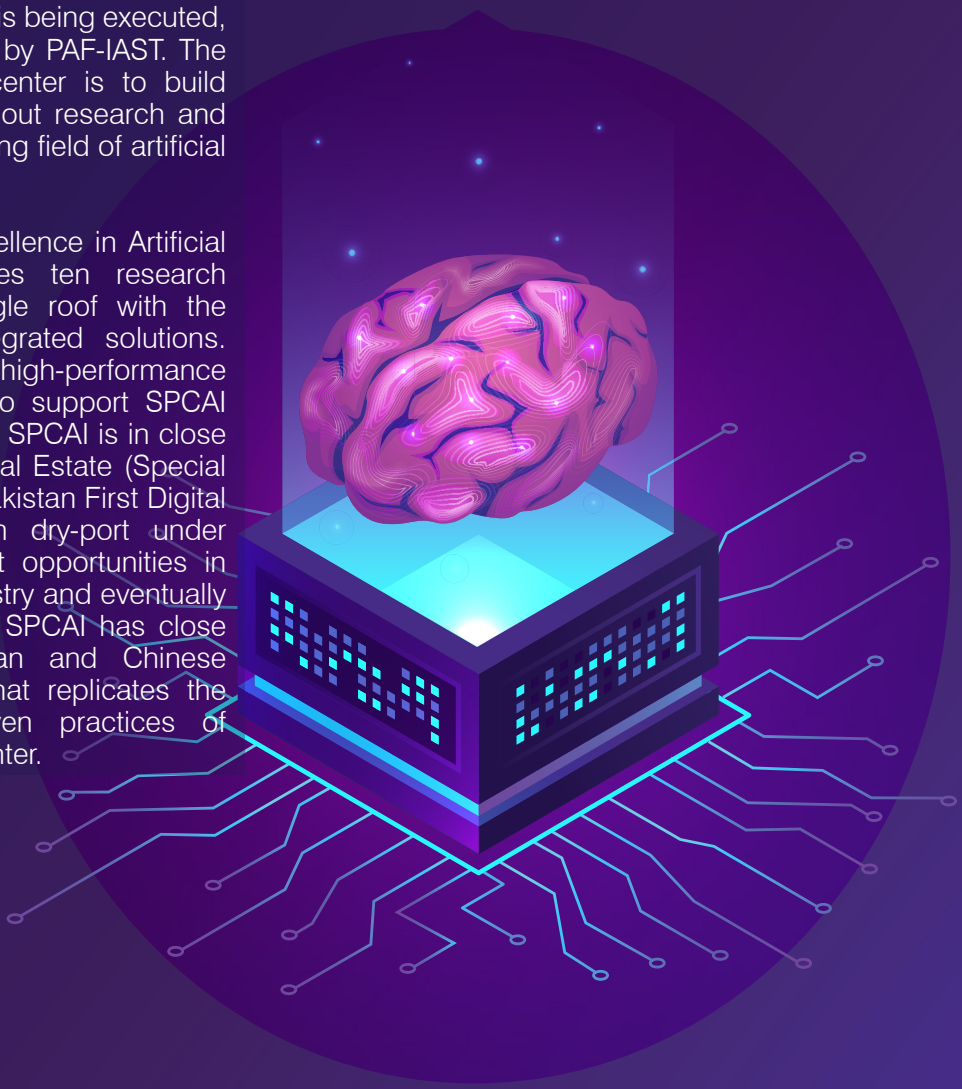
MOUs & MOAs with the following Universities in China have been signed

CENTRE OF EXCELLENCE	MOA & MOU SIGNED
Railway Engineering	Beijing Jiaotong University
Agriculture Food Technologies	Jiangsu Agriculture University (JSU)
Mineral Resources Engineering	China University of Mining and Technology
Artificial Intelligence	Guangdong University of Technology (GDUT) and SIAT

SINO-PAK CENTRE OF ARTIFICIAL INTELLIGENCE (SPCAI)

SPCAI is sponsored by the Ministry of Information Technology and Telecommunication (MoITT) under Public Sector Development Program (PSDP) (hereinafter referred to as 'SPCAI,' which expression shall include its successors and permitted assigns). SPCAI is being executed, maintained, and operated by PAF-IAST. The overall objective of the center is to build national capacity to carry out research and development in the emerging field of artificial intelligence.

It is the first center of excellence in Artificial Intelligence that integrates ten research laboratories under a single roof with the potential to develop integrated solutions. The center also has a high-performance computing infrastructure to support SPCAI and regional collaborators. SPCAI is in close proximity to Hattar Industrial Estate (Special Economic Zone-Hattar), Pakistan First Digital City, KPK, and Havellian dry-port under CPEC leads to significant opportunities in which AI can support industry and eventually the economy of Pakistan. SPCAI has close collaboration with Austrian and Chinese academia and industry that replicates the state-of-the-art and proven practices of establishing a research center.

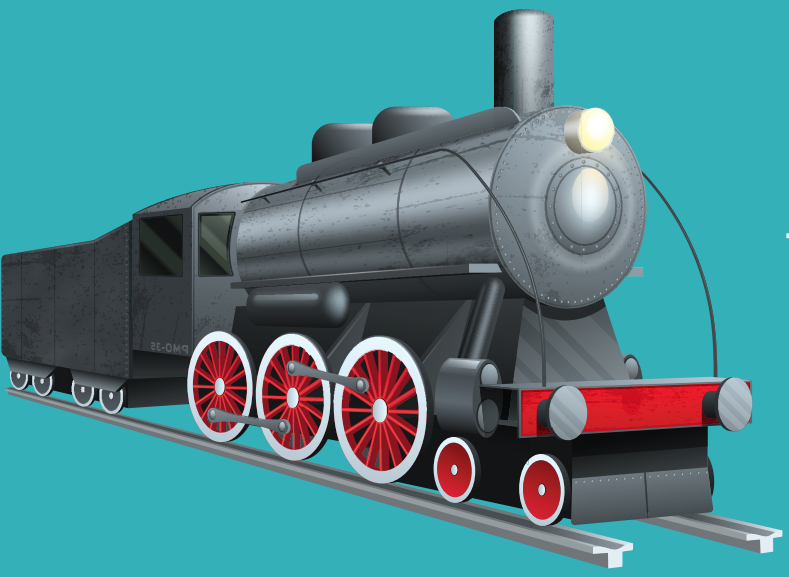


OBJECTIVES

- Build national capacity to carry out R&D in the emerging field of artificial intelligence by producing expertise through MS/PhD programs in collaboration with Chinese and Austrian universities.
- To solve local problems using AI and market them through the technology park.
- Provide high-value shared services to industrial partners.
- To engage faculty and students in applied research to fulfill the industrial requirement by providing innovative solutions, especially focusing on Pakistan's social and economic fabric.
- To establish a partnership with international research centers and leverage their rich experience to develop the Center for Artificial Intelligence as an internationally renowned center in AI, attracting international projects and customers.

NATIONAL AND INTERNATIONAL ACADEMIC LINKAGES FOR RESEARCH

1. National Engineering & Scientific Commission of Pakistan (NESCOM)
2. National Centre for Physics (NCP)
3. LENOVO
4. Advanced Telecom Services (ATS)
5. National Radio and Telecommunication Corporation (NRTC)
6. International Center for Chemical and Biological Sciences (ICCBS)
7. COMSTECH Organization of Islamic Cooperation Standing Committee on Scientific and Technological Cooperation
8. The Johannes Kepler University Linz (JKU),
9. Austria Software Competence Center Hagenberg (SCCH), Austria
10. Guangdong University of Technology (GDUT), China (MOA)
11. Shenzhen Institutes of Advanced Technology (SIAT), China (MOU)



CENTER OF EXCELLENCE IN TRANSPORTATION/ RAILWAY ENGINEERING (COETRE)

The Center of Excellence in Transportation/Railway Engineering (COETRE) has been established to train professionals for leadership positions in the transportation industry. In the fall of 2021, COETRE launched a specialized curriculum for a one-and-a-half-year MS Degree in Railway Systems Engineering.The first such academic program in Pakistan, if not in the region, has about thirty-two (32) students enrolled, twenty-seven (27) of whom are serving officers of Pakistan Railways, belonging to different disciplines namely, civil, mechanical, electrical, and stores and purchase departments. Knowledgeable and experienced faculty comprising of 'Professors of Practice' from different disciplines of the railway industry and qualified academicians from the universities are teaching the students. Foreign faculty has also been engaged to teach different subjects. The Center of Excellence is all set to introduce another important MS Degree Program in Transportation Systems Engineering from the Fall 2022.

In consonance with the PAF-IAST's slogan of 'Skilling Pakistan", COETRE has also successfully undertaken skill development short courses for officers of Pakistan Railways. So far, almost two hundred (200) officers, belonging to different departments of Pakistan Railways, have been trained at the PAF-IAST campus. Efforts are underway to start short courses in other rail-related technical fields and to provide IT-related skills to the railway employees at their places of posting.

To achieve excellence in the field of transportation and railways and to keep abreast with international best practices in the field, COETRE has already signed a Memorandum of Agreement with the prestigious Beijing Jiaotong University, Beijing, China, (BJTU). The two institutions are actively engaged with each other for enhancing cooperation in the field of faculty training and exchange and also student exchange resulting in dual degrees.

OBJECTIVES

- A Center of Excellence in Transportation/Railway Engineering has been established at PAF-IAST in Pakistan to address the neglected field of transport sector, to educate and research this field.

- The Center of Excellence in Transportation/Railway Engineering was created to aid the Government of Pakistan's efforts to improve its transportation network by investing in highways, railway network upgrades, international connectivity, port and shipping development, increasing aviation capacity, and developing pipelines for gas and fuel.

- Investments of billions of dollars have been pledged through programs such as the China-Pakistan Economic Corridor (CPEC) and Central Asian Regional Economic Cooperation (CAREC) to upgrade railway and motorway projects, ports and provide connectivity by rail and road between Pakistan.

- The AI Center for Transportation focuses on providing MS Degrees in Transportation Engineering and Railway Systems Engineering, as well as skill development programs for over 200 Pakistan Railway officers and other modes of transportation.

- The Center for Rail Transport Research has 26 active rail-related research projects and anticipates more to come with the implementation of CPEC and CAREC, also established a mutually beneficial relationship with the Beijing Jiatong University, China, to bolster their academic and research pursuits.

- The Centre for Transportation stays informed of latest advancements and developments in transportation around the world to benefit students and researchers with modern international standards and practices.

NATIONAL AND INTERNATIONAL ACADEMIC LINKAGES FOR RESEARCH

1. Beijing Jiao tong University (Foreign Industrial Liaison partner & Dual Degree Program)

2. Pakistan Railways

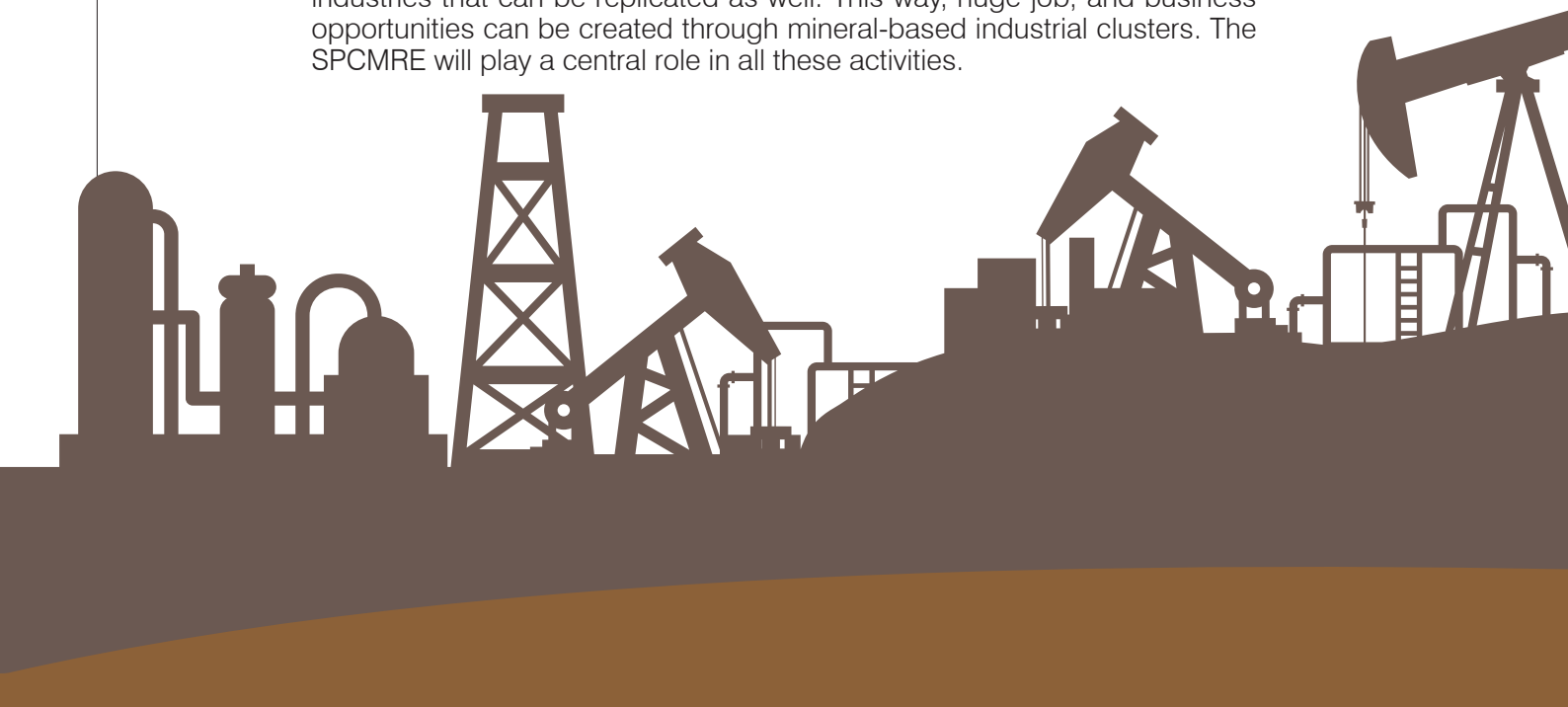
3. Ministry of Railways

4. Walton Academy

MINERAL RESOURCE ENGINEERING

Sino-Pak Center for Mineral Resources Engineering (SPCMRE) is soon to be established at PAF-IAST. The Chinese Government Funding Agency, China International Development Cooperation Agency (CIDCA) has approved funding for four centers at PAF-IAST of which a major share will be given to this center. State-of-the-art facilities are going to be established here with the cooperation of the Chinese biggest mining university, the China University of Mining & Technology (CUMT). These facilities include everything from prospecting to mineral processing and even extractive metallurgical pilot plants are going to be established here. These unique features will make this center a distinguished and the only one of its kind in Pakistan.

SPCMRE has already signed MoU & MoA with the Minerals Development Department (MDD) of Khyber Pakhtunkhwa. SPCMRE is working on a 10 year (2022-32) strategic action plan, the minerals policy 2022 & the pilot plants located in the Mineral Testing Laboratories, Peshawar in collaboration with MDD. These include Nepheline Syenite, Malakand Chromite, Copper, Iron, Silver, and Gold extraction plants. The students of the center are already working on these plants and it is planned to improve the capacity & diverse applications of these units. These plants can be presented as model industries that can be replicated as well. This way, huge job, and business opportunities can be created through mineral-based industrial clusters. The SPCMRE will play a central role in all these activities.

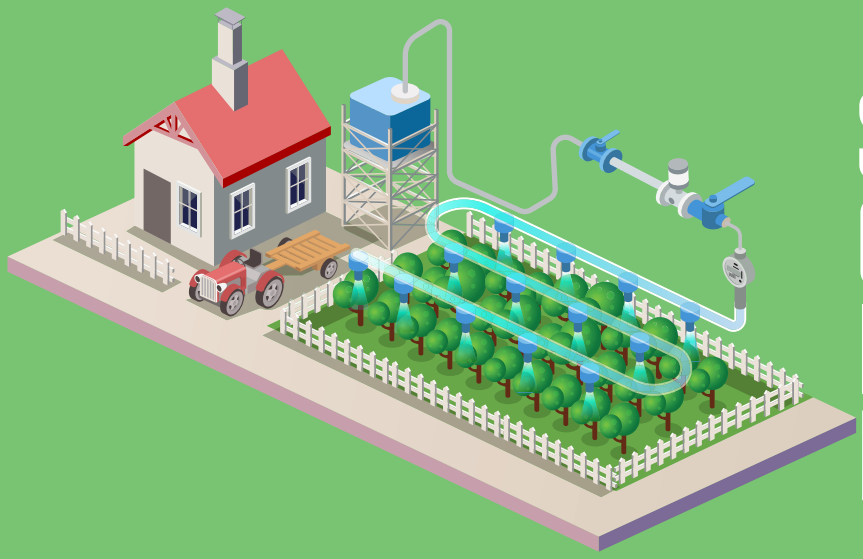


OBJECTIVES

1. Research and development for value addition of mineral resources
2. Business development in the mineral sector
3. Extraction of metals and other mineral-based products.

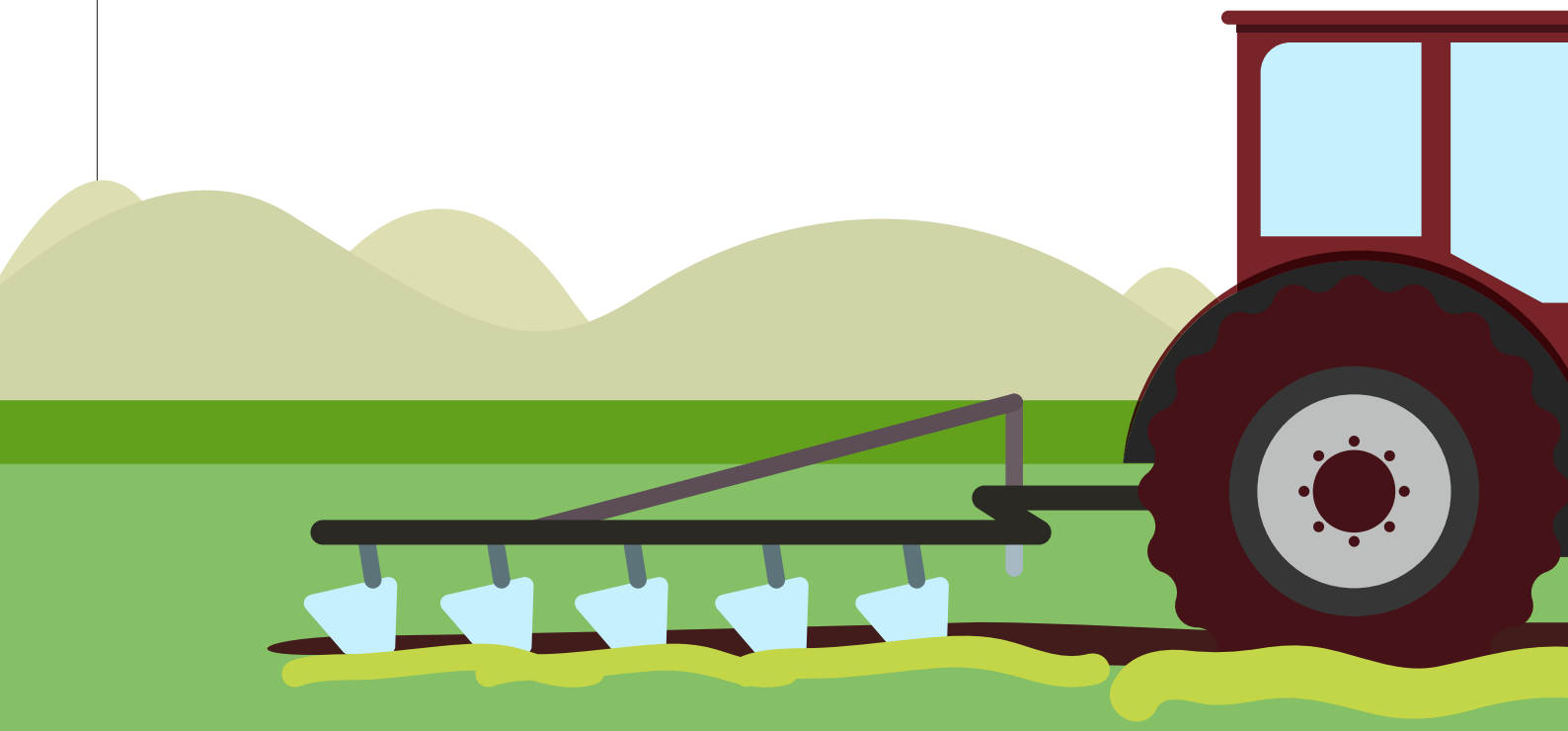
NATIONAL AND INTERNATIONAL ACADEMIC LINKAGES FOR RESEARCH

1. University of Mining & Technology (CUMT)
2. Minerals Development Department (MDD) of Khyber Pakhtunkhwa



SINO-PAK CENTER OF EXCELLENCE IN AGRICULTURE FOOD TECHNOLOGIES

Pakistan is an agricultural country where different crops are produced in huge quantities. However, food losses are very high due to the lack of proper technology which leads to food shortage and food scarcity in different regions ofthe country are in an alarming situation. Therefore, the establishment of a “Sino-Pak Center of Excellence in Agriculture Food Technologies” is the utmost need of the time. For this purpose, a memorandum of agreement (MOA) had been signed with Jiangsu University China.

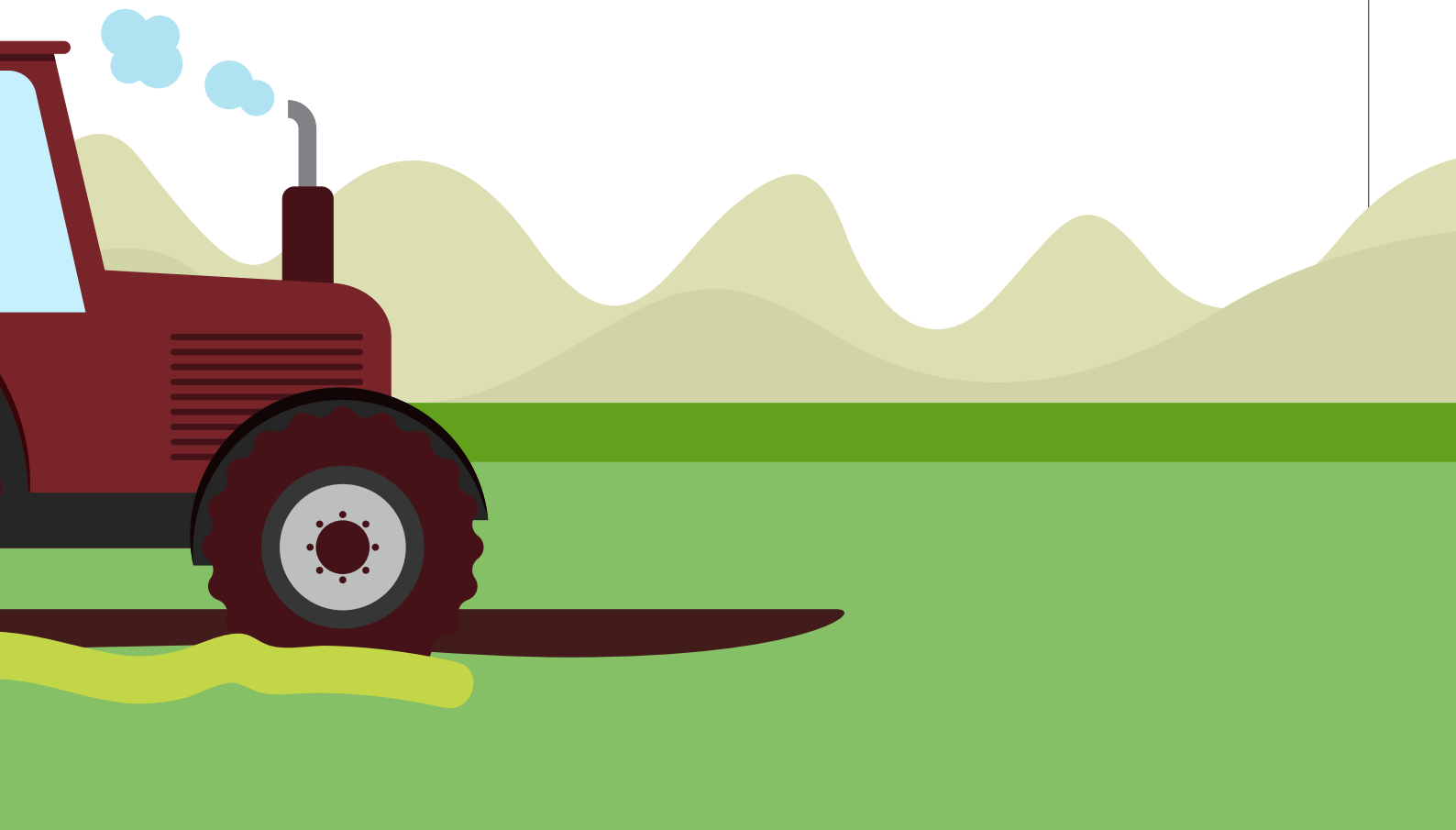


OBJECTIVES

- Build national capacity to carry out R&D in the emerging field of Food Processing and Packaging Technology with the mutual understanding and collaboration of national and international experts.
- Solve problem of food shortage by increasing agriculture food production and provision of appropriate food nutrition.
- Provide the basis for Agro-based small-scale industries.
- Reduction of food losses particularly, fresh fruits and vegetables and enhancing their processing, preservation, and packaging.
- Provide high-value shared services to academia, startups and industrial partners.
- Human Resource Development in various food sectors.

NATIONAL AND INTERNATIONAL ACADEMIC LINKAGES FOR RESEARCH

1. Jiangsu University China.
2. Austrian Universities



FUNDED PROJECTS

TITLE: DESIGN OF HYBRID POWER MANAGEMENT UNIT FOR THE OPERATION OF POINT MACHINE SYSTEM IN PAKISTAN RAILWAY FOR EFFICIENT TRAFFIC CONTROL

PRINCIPAL INVESTIGATOR
Dr. Muhammad Aamir, Assistant Professor, Department of Electrical and Computer Engineering

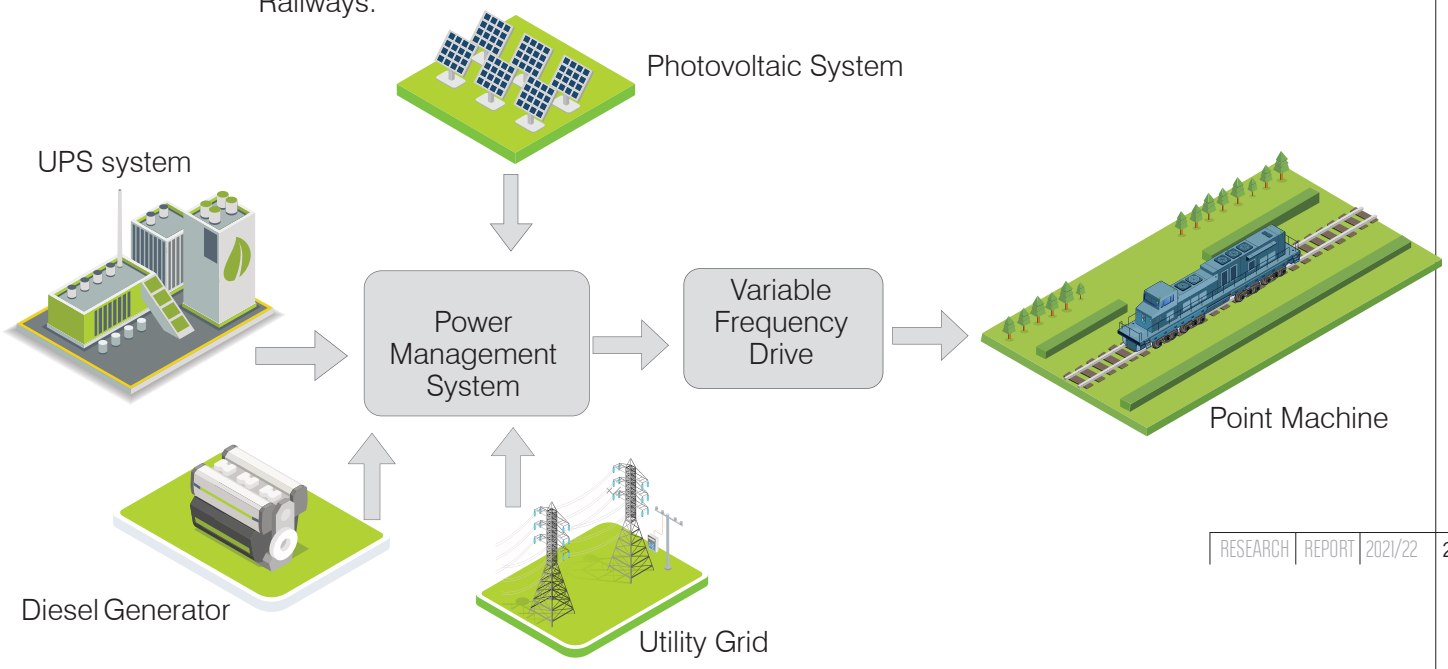
CO-PI
(Affiliation)

FUNDING AGENCY
NRPU, Higher Education Commission, Pakistan

AMOUNT
3.5 Million PKR

ABSTRACT
Pakistan railways faced the problems of train delays due to the unavailability of power for the signaling system. This causes loss to the economy and damages the reputation of the organization. Therefore, a novel power management system has been proposed that can provide uninterruptible power to the signaling system.

PMU IMPACT ON SOCIETY
The proposed project will provide uninterruptible power to the signaling system which will solve the problems of train delays faced by Pakistan Railways.



TITLE: DEVELOPMENT OF SOLID OXIDE ELECTROLYZER CELL (SOEC) TECHNOLOGY TO BE INTEGRATED WITH COAL/GAS-FIRED POWER PLANT EXHAUST FOR EFFECTIVE CO2 UTILIZATION

PRINCIPAL INVESTIGATOR

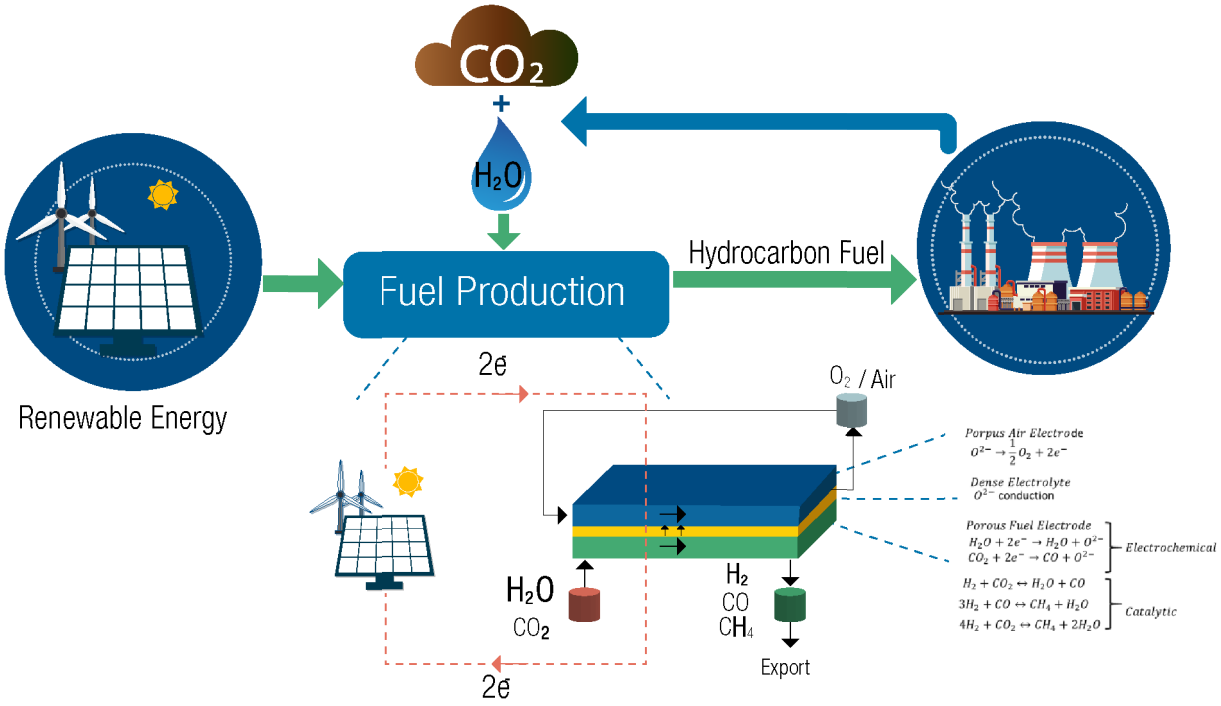
DR. MUHAMMAD ZUBAIR KHAN ASSISTANT PROFESSOR, DEPARTMENT OF MINERAL, MINING AND MATERIAL ENGINEERING

ABSTRACT

The excessive use of fossil fuels in the industry in Pakistan is one of the major sources of CO2 emission in the environment. We have proposed the development of solid oxide electrolyzer cell (SOEC) technology to be integrated with coal/oil/gas-fired power plant exhaust for effective CO2 utilization. This technology suggests a most suitable solution for reducing the CO2 emission from industrial exhaust to the environment, thereby, addressing the issues of climate change and global warming.

GRAPHICAL ABSTRACT:

Schematic representation of our solution to mitigate the CO2 emission at industrial exhaust using electrical energy from renewable/nuclear sources and producing synthetic fuel for the industry.



TITLE: DEVELOPMENT & CHARACTERIZATION OF HVOF SPRAYED CHROMITE POWDER COATINGS AS AN ALTERNATIVE TO HARD CHROME PLATING

PRINCIPAL INVESTIGATOR:
Dr. Abdul Mateen Khan

FUNDING AGENCY
Pakistan Science Foundation

AMOUNT
9,835,762.00 PKR (~9.83M PKR)

ABSTRACT
Pakistan is rich in mineral resources. These resources can be used for the betterment of the country. If these materials are converted into value-added products, this can result in creation of large number of jobs & business opportunities. This can reduce dependence on imports and increase revenue because of the much higher value of the products.

IMPACT ON SOCIETY
The potential impact of this effort can be huge, as it shall put Pakistan on the clean energy of the region, if not the world, and accelerate its march towards green and sustainable mobility solutions. Furthermore, the project can result in the sub-system's expertise for long-term indigenous development and commercialization in reducing global warming.

Academia
1. Pak-Austria Fachhochschule-Institute of Applied Sciences & Technology, Haripur

Industries
1. Tuny-Pak Minerals Pvt. Ltd. Islamabad
2. Armenza International Pvt. Ltd, Sialkot
3. JEBRA Minerals & Metallurgy Pvt. Ltd. Islamabad

GOVT. of KPK

TITLE: ESTABLISHMENT OF DNA BASED PRE-SYMPTOMATIC DIAGNOSTIC METHODS FOR GLAUCOMA

PRINCIPAL INVESTIGATOR
DR. HUMAIRA AYUB, ASSISTANT PROFESSOR, DEPARTMENT OF BIOMEDICAL SCIENCES

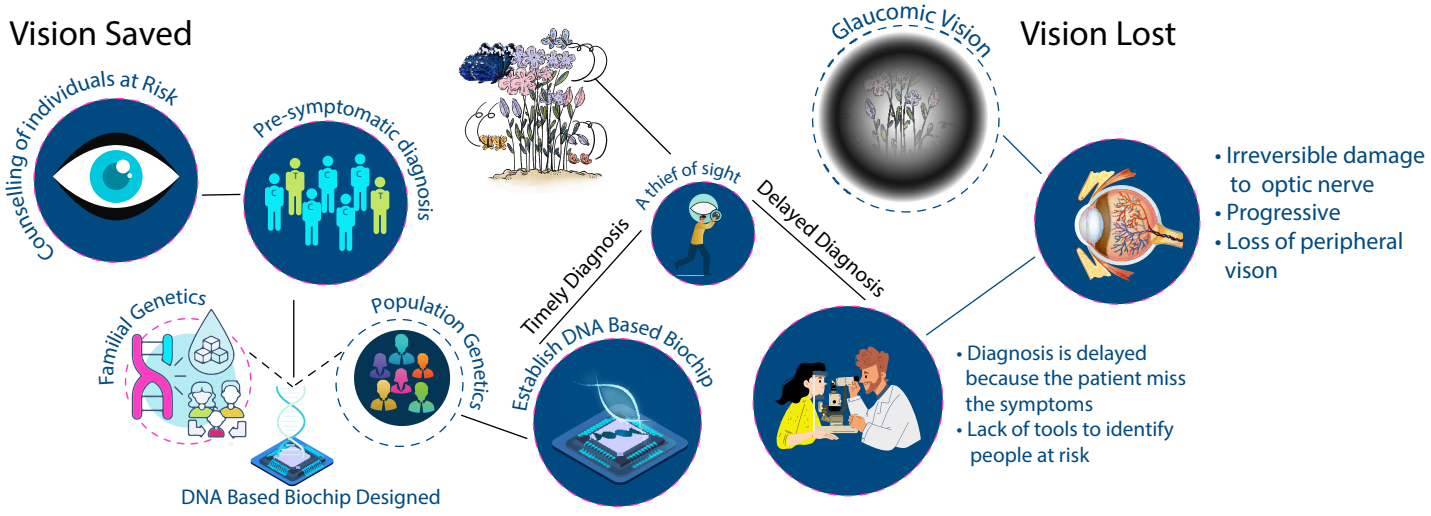
CO PI
DR. SADIA MEHMOOD

FUNDING AGENCY
HIGHER EDUCATION COMMISSION, PAKISTAN

AMOUNT
12.8 MILLION PKR

ABSTRACT
Glaucoma initiates and progresses without the notice of the patient, resulting in loss of central vison. We aim to discover molecular biomarkers for early indication of the disease risk and save the sight. We will determine the genetic component of the disease, and establish a DNA-based pre-symptomatic diagnostic biomarker that will help in carrier testing and identify the individuals at risk followed by monitoring and counselling of the patients.

GRAPHICAL ABSTRACT
The project conforms to the health and well-being of individuals improving The project conforms to the health and well-being of individuals with early and pre-symptomatic diagnosis of the disease, identifying individuals at risk of development of the disease thus saving them from getting blind.



TITLE: PRECLINICAL DRUG PROFILING IN ANIMAL MODEL OF DRUG ADDICTION USING BEHAVIOR AND FUNCTIONAL PHARMACOGENETICS APPROACH

PRINCIPAL INVESTIGATOR

DR. MUHAMMAD IMRAN KHAN, ASSISTANT PROFESSOR, DEPARTMENT OF BIOMEDICAL SCIENCES

FUNDING AGENCY

HIGHER EDUCATION COMMISSION, PAKISTAN

AMOUNT

9.76 MILLION PKR

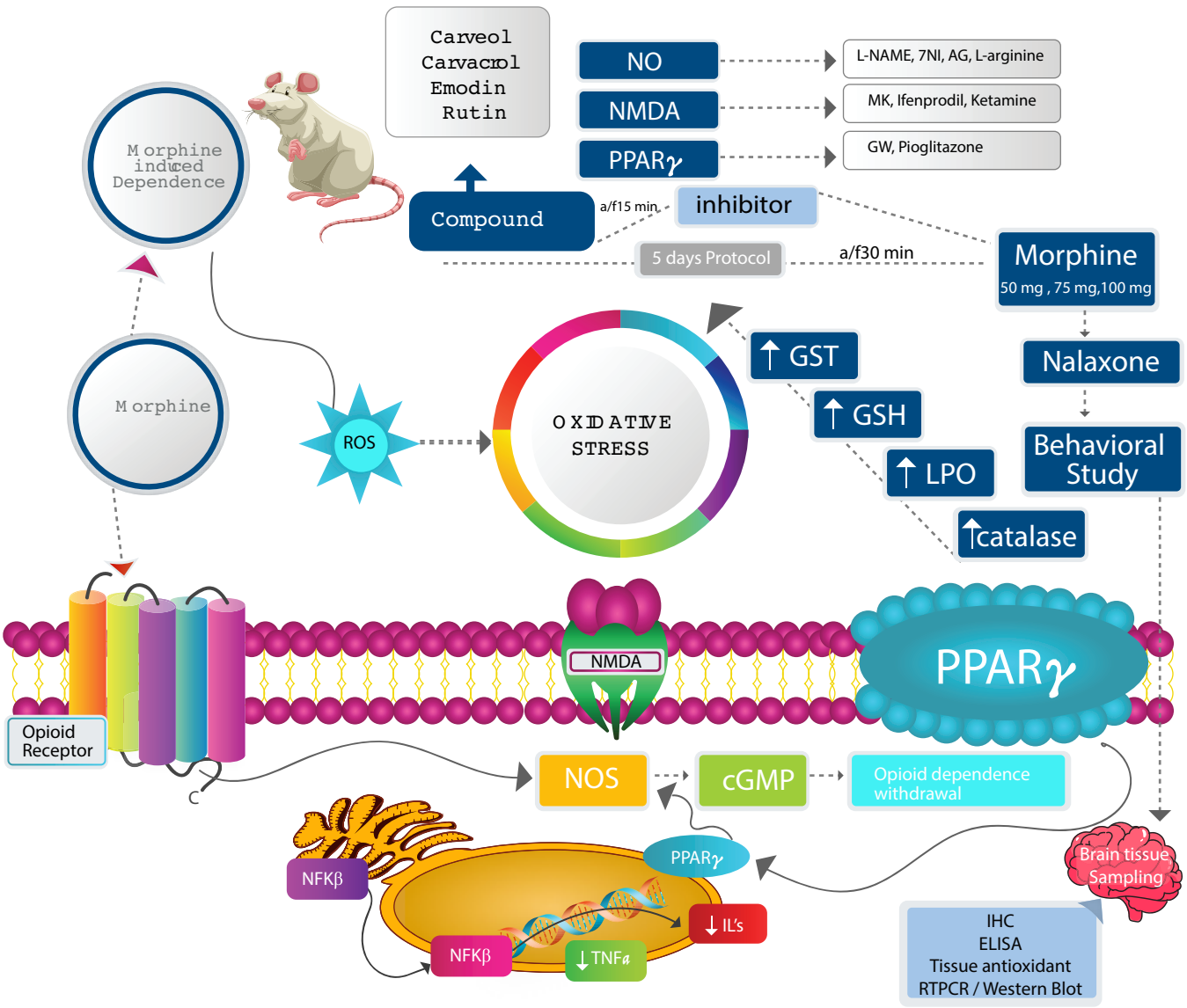
ABSTRACT

Drug addiction is a foe that affects most of the population worldwide. The psychoactive drugs from natural sources or their derivatives as pure compounds are extensively studied for various CNS activities such as antipsychotics, antianxiety, schizophrenia, and antidepressant activity but hitherto have not been evaluated for de-addiction property, dependence, and tolerance i.e. against drug abuse. It has also been proposed that different intra- extracellular signaling like NMDA, NF-KB, Dopamine, GABA, nitric oxide system, etc. in various brain regions, inflammation, and oxidative stress has an important pathological role in drug addiction, dependence, and tolerance. The discovery of various biomolecules against these targets may be useful agents in the prevention of withdrawal syndrome and drug relapse. Thus, the strategy of blocking oxidative stress, inhibiting various biosignaling, and inflammation by well-known natural compounds such as resveratrol, Carvacrol, curcumin, etc. may be useful in the development of a new therapy for drug tolerance and withdrawal syndrome. Hence, the main objective of the present research project is to investigate the therapeutic potential of these psychoactive medicinal agents and their pure compounds for the treatment of morphine/alcohol/heroin/methamphetamine addiction and withdrawal in the animal model and to examine and uncover the various molecular basis for their effective treatment.

IMPACT/ OUTCOME

In the modern world, scientific advancements in terms of technology and research for new drug development has brought a dramatic change in designing innovative drugs and efficient treatment protocols for various non-communicable and neuropsychiatric diseases. However, still there exist many research gaps which if addressed can fix many health-related problems and can cure various associated comorbidities. The demographics show

that in neuropsychiatric disorders, addiction to various drugs like morphine, cocaine, methamphetamine, marijuana, etc. has an important place to be addressed at the earliest as it highly affects the socioeconomic aspect of society. The addicted individual under treatment faces severe withdrawal symptoms during abstinence which must be addressed symptomatically. The consequences of this withdrawal effect, limited use for medical purpose due to tolerance and dependence, and relapse of addiction appealed us to search for a new drug that might have a high potential for addressing the issue of drug addiction. It will boost the economic condition of our nation via drug development and research integrity in international forums. Such research will also minimize the healthcare burden and patient suffering.



TITLE: AUTOMATED DETECTION OF ACUTE ISCHEMIC INFARCT ON "CODE STROKE" HEAD CT USING DEEP NEURAL NETWORKS

PRINCIPAL INVESTIGATOR
DR.MUHAMMAD MOHSIN KHAN

FUNDING AGENCY
HIGHER EDUCATION COMMISSION, PAKISTAN

AMOUNT
4.3 MILLION PKR

ABSTRACT
Strokes are caused by an abrupt blockage of arteries leading to the brain (ischemic stroke), stroke is also called a brain attack. Other strokes are caused by bleeding into brain tissue when a blood vessel bursts (hemorrhagic stroke). It affects the entire body, including paralysis or partial paralysis, cognitive and memory deficits, speech and visual issues, emotional difficulties, daily living challenges, and pain. Paralysis is a common outcome of stroke, often on one side of the body. Because stroke occurs rapidly and requires immediate treatment. In Pakistan, the incidence rate of stroke is very high, and it is increasing to 350,000 new cases every year. (1)

Deep neural networks with volumetric analysis capabilities have achieved promising results in the classification of medical images. These machine learning models can help with surveillance and diagnosis of critical findings like acute infarct, which can be particularly important in resource-challenged parts of the country without access to subspecialty-trained radiologists. Deep neural networks require high-performance computational machines and a large amount of training datasets.

TITLE: 1. SMART CITY AND URBAN PLANNING INTELLIGENT FORECASTING AND CONTROL OF ENERGY STORAGE FOR SMART BUILDINGS (IN-TERACT)

PRINCIPAL INVESTIGATOR
Dr. Sohail Khan

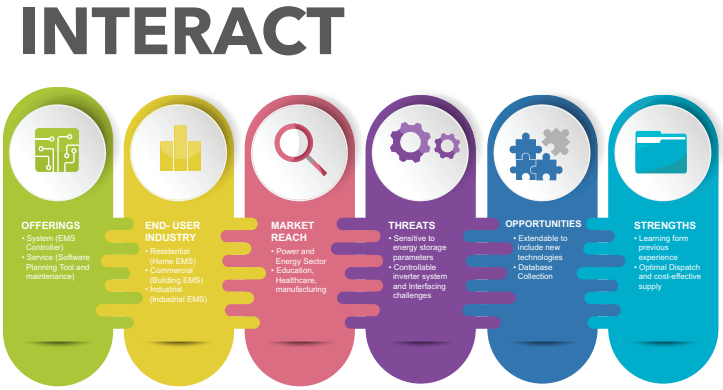
CO-PI
Mr. Imad Asif from IKS Services Pvt Ltd (Industrial Collaborator)

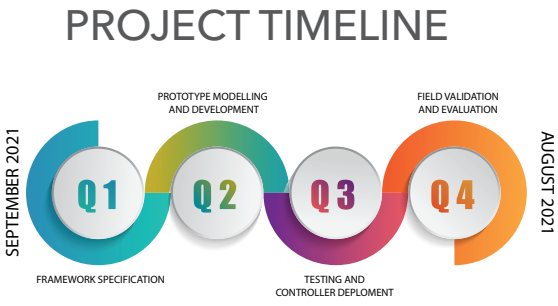
FUNDING AGENCY
SPACI

AMOUNT
5.97 Million PKR

DURATION
One Year

ABSTRACT
The primary goal of the project is to develop and test a prototype energy management system for buildings that minimize the cost of energy and ensure the availability of the energy supply. It is assumed that a PV system and storage have been installed at the building.





TITLE: 2. GESTAR – INTERNET OF THINGS USING MM-WAVE RADAR AND AI FOR DEVELOPMENT OF NEW GESTURE LANGUAGE

PRINCIPAL INVESTIGATOR

Dr. Zaffar Haider Janjua

CO-PI

Dr. Hammad M. Cheema

INDUSTRIAL PARTNER

Renzym Pvt. Ltd.

AMOUNT

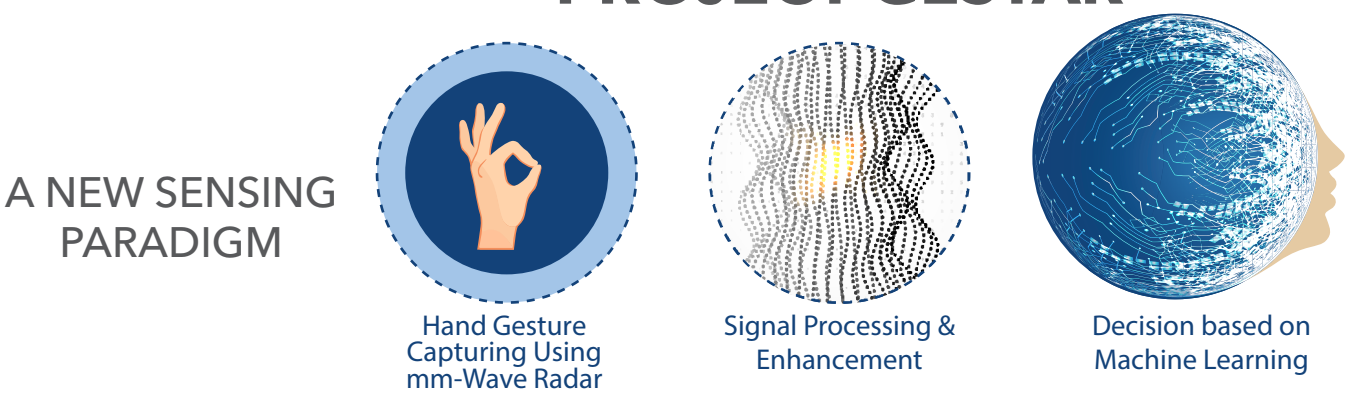
PKR 6.5 Million

DURATION

One Year

ABSTRACT

The project aims to develop a hardware-software framework for obtaining radar data, formulate a library of unique gestures suitable for detection using mm-wave radar, develop a machine learning pipeline for gesture recognition and classification, integrate the radar hardware-software system with few public use devices, test and customize the product for the use-cases of public interest such as touchless systems and assistive living devices for blind people, and demonstrate a working system to potential customers at an open-day.



TITLE: 3. INTELLISURV – COMPUTER VISION AN INTELLIGENT SURVEILLANCE SYSTEM FOR DETECTION OF ANOMALIES IN REAL-TIME VIDEOS

PRINCIPAL INVESTIGATOR
Dr. Fiza Murtaza

CO-PI
Dr. Muhammad Haroon Yousaf (from Academia), Dr. Muhammad Zeeshan (From Industry)

INDUSTRIAL COLLABORATOR
Advanced Telecom Services

AMOUNT
PKR 5.3 million

DURATION
One Year

ABSTRACT
The primary goal of the project is to propose IntelliSurv system targeting the development of an intelligent add-on in surveillance systems through the deployment of AI-on-the-Edge technology for anomaly detection in real-time videos.

4. INTELLIGENT BIOMEDICAL APPLICATIONS SIGHT FOR BLIND-SPOT

A SMART REHABILITATION TRAINING PROTOCOL FOR INDIVIDUALS WITH RETINAL DEGENERATIVE DISEASES

PRINCIPAL INVESTIGATOR
Humaira Ayub

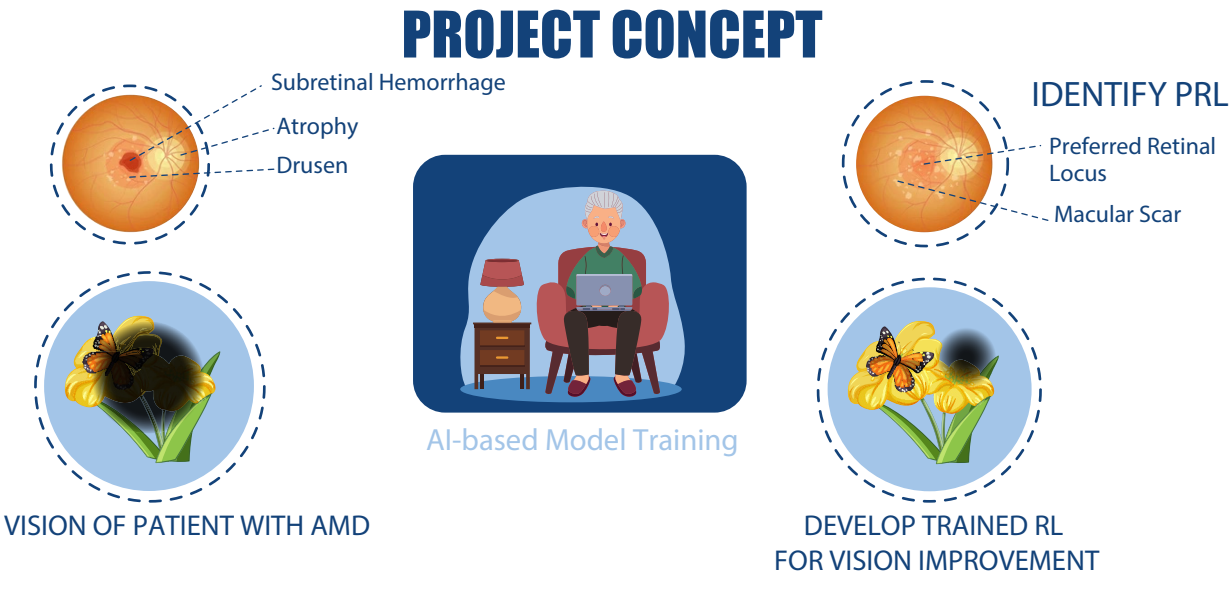
CO-PI
Syed Omer Gilani

INDUSTRIAL PARTNER
N-Ovative Health Technologies Pvt Ltd

AMOUNT
PKR 6.9 MILLION.

DURATION
One Year

ABSTRACT
The primary goal of the project is to develop a smart rehabilitation solution for Retinal Degenerative Diseases (RDD) based on patients' visual field specifications (saccades and blind-spots) so that they can learn faster by utilizing their residual vision.



INDUSTRIAL PROJECTS

TITLE: DEVELOPMENT OF A 2-IN-1 COMBO RAPID TESTING ASSAY FOR MALARIA AND DENGUE

PRINCIPAL INVESTIGATOR
Dr. Farakh Javed/ PAF-IAST

CO-PI
Dr. Muhammad Arslan Latif

FUNDING INDUSTRY
Human Health care

AMOUNT
PKR 0.5 million

ABSTRACT
Malaria and Dengue have the same symptoms, and both are vector-borne infections. Due to differential diagnosis, doctors get confused to identify the disease. The present aim of the study is to develop a 2-in-1 combo kit against dengue and malaria testing. This kit provides early diagnosis of malaria or dengue to help the physician to start treatment in time.

IMPACT ON SOCIETY
This kit provides early diagnosis of malaria or dengue to help the physician to start treatment in time. Moreover, this kit will give accurate and sensitive results as it will be developed from the local strains circulating in the population of Pakistan.

INDUSTRIAL PROJECTS

TITLE: MOSSCENT:DEVELOPMENT AND FORMULATION OF INSECT REPELLENT BASED ON HERBAL AND NANOSTRUCTURED LIPID CARRIER

PRINCIPAL INVESTIGATOR
Dr. Muhammad Imran Khan

CO-PI
Dr. Wajid Ahmad Qureshi

FUNDING INDUSTRY
MEDEVOX Pharmaceuticals Pvt.Ltd. Islamabad

AMOUNT
PKR 0.7 MILLION

ABSTRACT
MOSSCENT is an insect-repellent product based on herbal and nanostructured lipid carrier. The product is highly breakthrough in terms of its formulation, as it is free from all those formulations such as DEET, Clove oil, Citronella oil, and IR3535 which are toxic in long run, aren't environmentally friendly and can cause Delirium, skin allergies, hives, and urticaria when frequently used.

IMPACT ON SOCIETY
All those insects repellent present in our local market used in our society contain chemicals that are hazardous for different ages and sex. MOSSENT is a solution for all those existing problems.

FACULTY TRAININGS

FACULTY TRAINING AND POST-DOCTORAL TRAINING SPONSORSHIP

PAF-IAST is in collaboration with FH JOANNEUM and MCI | The Entrepreneurial School Austria for faculty development training. Twenty-Three Faculty members from five (05) departments of PAF-IAST were sent for four-month training to Austria for capacity building in university management system. The faculty had extensive training lectures and industrial visits in Austria related to the management of applied research projects, industrial linkages, accreditation of its programs, and internationalization. The purpose is to bring the applied research concept to Pakistan and to enable the students of PAF-IAST for practical skills and applied research projects. This will help in contributing to society and advance the Pakistani nation to the best level so that they could be capable to implement the emerging technologies in real-life applications.

PAF-IAST also sponsors Post-doctoral training for its faculty members to get faculty training and to conduct joint research projects in Austria. PAF- IAST is in research collaboration with SCCH Austria and the Institute of Software Systems Engineering (ISSE), Johannes Kepler University (JKU), Linz. Currently, three Faculty members; Dr. Maqbool Khan, Dr. Waqar Mehmood, and Dr. Arshad Ahmad, from the Department of IT and Computer Science are in Austria for post-doctoral training. Dr. Maqbool Khan is involved in conducting research at SCCH focusing on data-driven solutions for smart and intelligent manufacturing under the hood of industry 4.0 & 5.0 revolution and the digital twin concept. The research area is Prognostics and Health Management (PHM) specifically Human-Centered AI and predictive analytics in smart industry domain. He joined SCCH for post-doctoral training to work jointly with the SCCH team and assist them on project deliverables during his stay at SCCH. Currently, he is involved in two EU-funded projects. At the institute of Software Systems Engineering at JKU, Austria Dr. Arshad Ahmad is mainly dealing with the challenges of requirements engineering for developing Artificial intelligence systems. In addition, he is also involved in one project teaming.ai with SCCH, Hagenberg, Austria as well. Research by Dr. Waqar Mehmood at JKI focuses on Microservice architecture (MSA) and it's applications. He joined JKU for post-doctoral training to work jointly with the ISSE team and assist them on project deliverables during his stay at JKU. Currently, he is involved in investigating how variability management, model-driven engineering, software reusability, and product extraction can be done in the MSA paradigm.

RESEARCH PRODUCTIVITY

RESEARCH PRODUCTIVITY

PATENTS 2021

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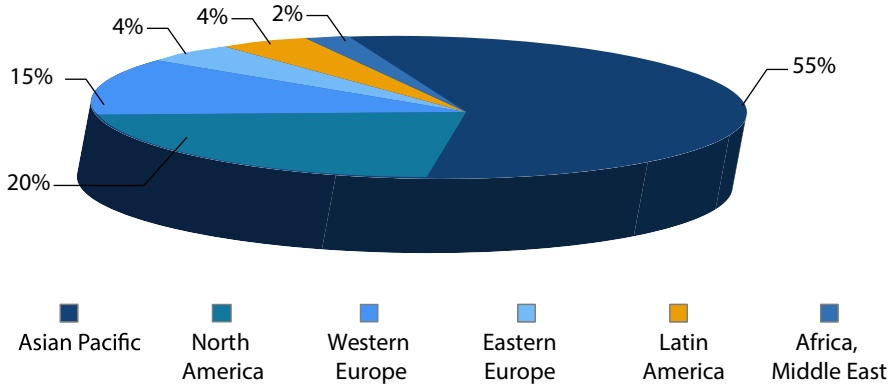
RESEARCH PRODUCTS

PRODUCT: BIO-CELLULOSE FACIAL MASK
SKIN GLOW FACIAL MASK(S)

PROBLEM
No local production of Biocellulose facial masks in Pakistan

SOLUTION
Indigenization of the production process of Biocellulose cosmetic products

GLOBAL MARKET SIZE OF FACIAL MASK
- Beauty has blown up to be a $532 billion industry
- Compound Annual Growth Rate: 5.9%
- On average women spends $313 on appearance each month



PRODCUT: BURN SKIN OINTMENT
COMMERCIAL NAME: DERMOIT

PROBLEM
Each year approximately 11 million people suffer from burn wounds, 180,000 of whom die because of such injuries

STRATEGY
Combining the resins and oil in a specific quantity

SOLUTION
Dermoit is the herb-based skin ointment for skin burn patients to solve the problems related to the duration of healing time, burn scars, bruises and allergic complications by providing the safe and secure alternative

MARKET SIZE
The Burn Ointment Market size was $841.9 million in 2020 and is poised to grow at a CAGR of 6.1% over the forecast period of 2021-2026.

PRODUCT: HERBAL HAIR OIL
COMMERCIAL NAME: PELOS OIL

A SMART REHABILITATION TRAINING PROTOCOL FOR INDIVIDUALS WITH RETINAL DEGENERATIVE DISEASES

PROBLEM
Extreme hairfall rough texture Dandruff

STRATEGY
Combining the different herbs and oils in a specific amount to come with all-in-one solution.

SOLUTION
Pelos Oil

MARKET SIZE
The global hair care market size reached US$ 82.3 Billion in 2022. Looking forward, IMARC Group expects.

SEMINARS, CONFERENCES AND WORKSHOPS

SEMINARS, CONFERENCES AND WORKSHOPS

1. How to Protect yourself and others from COVID-19
   Presented by Dr. Waqar Khalid Saeed

2. Webinar on Artificial Intelligence of things: When Artificial Intelligence Meets the Internet of Things
   Presented by Dr. Arshad Iqbal

3. Webinar on Text Classification Using Deep Learning Techniques
   Presented by Dr. Muhammad Ilyas Azeem

4. Webinar on Application of Artificial Intelligence in Pathology Detection
   Presented by Dr. Jawad Hussain

5. Webinar on Use of AI For Low Vision Rehabilitation
   Presented by Dr. Hafsah Ahma

6. Webinar on Agriculture 4.0- The Future of Farming Technology
   Presented by Dr. Ihtisham Ali

7. Webinar on Human-AI Teaming for Evolving AI Systems in Manufacturing
   Presented by Dr Maqbool Khan

8. Webinar on Applications of Machines Learning in Software Engineering
   Presented by Mr. Saad Shafiq

LINKAGES AND COLLABORATIONS

LINKAGES AND COLLABORATIONS

SPCAI NATIONAL AND INTERNATIONAL COLLABORATION

1. Guangdong University of Technology, China
   Duration: 5-years
2. Jiangsu University (JSU), China
   Duration: 5-years
3. University of Science and Technology, Beijing, China
   Duration: 3-years
4. Beijing Jiaotong University (BJTU), China
   Duration: 5-years
5. China University of Mining and Technology (CUMT)
   Duration: 3-years
6. Shenzhen Institute of Advance Technology (SIAT)
   Duration: 3-years
7. Shanghai University, China
   Duration: 3-years
8. Scch Software Hagenberg GmbH Austria
   Duration: 3-years
9. Minerals development department government of KPK
   Duration: 3-years
10. AKHUWAT college Kasur
    Duration: 3-years
11. Akhuwat Islamic Microfinance (AIM)
    Duration: 3-years
12. The department of science & technology of Guangdong province of the people's of republic of China
    Duration: 3-years

13. ASPIRE
Duration: 3-years

14. Federation of Pakistan chambers of commerce & industry (FPCCI)
Duration: 3-years

15. COMSTECH Organization of Islamic cooperation Standing Committee
Duration: 2-years

16. National Radio and Telecommunication corporation, Haripur
Duration: 3-years

17. Advanced telecom services
Duration: 2-years

18. Lenovo
Duration

19. SWJT Southwest Jiaotong university
Duration: 3-years

20. PTCL
Duration:

21. National center for physics, Islamabad
Duration: 2-years

22. National engineering & scientific commission of Pakistan (NESCOM)
Duration: 2-years

23. International center for chemical and biological sciences (ICCBS)
Duration

24. National Engineering & Scientific Commission (NESCOM)
Duration

25. Mindstorms Studios Game Studio
Duration

26. Zalmi Foundation (ZF)
Duration

27. National Radio and Telecommunication Corporation (NRTC)
Duration

28. Haripur Chamber of Commerce and Industry
Duration: 5-years

29. Edifiers Youth Networks
Duration: 2-years

30. Federation of Pakistan Chambers of Commerce & Industry (FPCCI)
Duration: 2-years

31. The Little Art
(A non-profit arts education organization
Duration: 2-years

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