

DEVELOPMENT OF AI IN INDIA

INTRODUCTION

Artificial intelligence (AI) entails the development of intelligent machines that can interact with their surroundings and reason, learn, perceive, and understand natural language.

The applications of AI are vast and ever-expanding. The field of AI holds enormous promise for influencing the future, revolutionizing industries, and enhancing human capabilities in a variety of domains as research and development in the subject continue.

AI is gaining significant traction in India and is being embraced across various sectors. In recent years, India has made notable advancements in the development of AI. It's worth noting that AI development in India is still evolving, and there are ongoing efforts to strengthen the ecosystem further. With the government's support, industry collaboration, and a growing pool of AI talent, India is poised to make significant progress in the field of AI in the coming years.

Future of AI in India

A NASSCOM analysis predicts that AI would increase India's GDP by 450–500 billion dollars by 2025, or 10% of the goal GDP of USD 5 trillion. The adoption of AI has been pioneered by highly digitized sectors like IT, financial services, telecommunications and media, and retail. Depending on the sector, AI adoption varies in terms of pace and scope. Early adoption can help businesses in industries with limited adoption of AI, such as healthcare and pharmaceuticals, energy and natural resources, and manufacturing, create economic moats.

India's AI industry was estimated by IMARC Group to be worth US\$680.1 million in 2022. Between 2023 and 2028, the market is anticipated to develop at a compound annual growth rate (CAGR) of 33.28%.

Various Organizations are keen on investing in AI technologies for a variety of purposes, including security, IT automation, customer service, and human resources.

India has already built an edge in AI talent. India is ranked top globally in both the concentration of AI talent and the penetration of AI skills, according to the most recent Nasscom survey. The rich and vast digital talent pool is quickly becoming more AI-skilled and meeting the need for talent in India and abroad.

Growing AI Ecosystem

India has seen significant growth in its AI ecosystem over the past few years. The government, academic institutions, startups, and multinational companies have actively contributed to the development of AI technologies.

Government Initiatives

The Indian government has recognized the potential of AI and has launched several initiatives to promote its development. The National Strategy for AI aims to position India as a global AI leader and focuses on research and development, skills development, data utilization, and establishing AI ethics guidelines. The National Institution for Transforming India (NITI Aayog) has published a national strategy for AI, focusing on research and development, adoption, and skilling.

Some of the notable government initiatives in India to nurture the AI ecosystem include:

(1) National Strategy for Artificial Intelligence (NSAI)

The government of India launched the NSAI in 2018 to outline the country's vision and approach toward AI development. The strategy focuses on leveraging AI for social and economic growth, addressing ethical concerns, building research and development capabilities, and promoting collaborations between industry, academia, and government.

(2) Atal Innovation Mission (AIM)

AIM is a flagship initiative of the Indian government aimed at promoting innovation and entrepreneurship across the country. Under AIM, several programs such as Atal Incubation Centers (AICs) and Atal Tinkering Labs (ATLs) have been established to nurture startups and encourage young students to develop an interest in emerging technologies like AI.

(3) National Programme on AI

The Ministry of Electronics and Information Technology (MeitY) launched the National Programme on AI in 2018 to facilitate the adoption and deployment of AI technologies in various sectors. The program focuses on research and development, capacity building, and creating an AI-ready workforce.

(4) AI for All

The AI for All initiative aims to make AI accessible to all citizens, especially those from underserved communities. It includes efforts to develop regional language datasets, provide training programs for government officials, and support the development of AI applications that address societal challenges.

(5) Centre of Excellence for AI Research

The government has established several Centers of Excellence (CoEs) for AI research in collaboration with premier academic institutions and industry partners. These CoEs focus on advancing AI research, promoting innovation, and providing a platform for academia-industry collaboration.

(6) Startup India

The Startup India initiative, launched by the government in 2016, supports the growth of startups across various sectors, including AI. It provides incentives such as tax benefits, funding opportunities, and regulatory support to foster a favorable environment for AI startups.

(7) Digital India

The Digital India program, launched in 2015, aims to transform India into a digitally empowered society and knowledge economy. It includes initiatives that promote the adoption of AI technologies, such as the use of AI in agriculture, healthcare, education, and governance.

Startups and Innovation

The number of AI companies and innovation centers has grown quickly in India. Major hubs for AI research and development have formed in cities like Bengaluru, Delhi, and Hyderabad. These startups are developing a number of AI applications in the fields of banking, e-commerce, healthcare, and agriculture.

AI startups in India

The first AI startups emerged in India in 2016. Studies say that AI startup businesses will experience extraordinary growth over the next two years. A recent report claims that Bengaluru, the startup capital of India, has received \$87.85 million in funding for the AI sector. India has positioned itself as a country with a strong ecosystem that allows AI startup specialists and entrepreneurs to develop their enterprises as a result of the significant growth in the AI sector.

Top 10 AI Startups in India (Source: [Top 10 AI Startups In India \(linkedin.com\)](#))

1. Avaamo

Avaamo is a deep-learning software company that focuses on conversational interfaces to address particular, significant business issues. To enable conversational computing for the

industry, Avaamo is constructing core AI technologies across a variety of neural networks, speech synthesis, and deep learning fields.

2. Heaps

Through the use of cutting-edge data analytics, AI, and ML, Heaps, a worldwide health tech platform and SaaS (Software-as-a-Service) provider, improves how healthcare is delivered and how payments are made.

3. Data Science Wizards (DSW)

In order to assist businesses in making data-driven decisions, DSW, an AI and data science start-up, principally provides platforms and solutions for using data as a strategy. It also provides consulting services in these areas.

4. SigTuple

The goal of SigTuple is to use data-driven intelligence to completely transform the field of medical diagnosis worldwide. In order to increase the precision and effectiveness of disease diagnosis, they seek to develop a data-driven, machine-learned, cloud-based solution for the detection of abnormalities and patterns in medical data.

5. Razorpay

Razorpay enables companies to accept, handle, and distribute payments with the help of its product lineup.

6. Yellow.ai

A conversational AI platform called Yellow Ai enables businesses to automate employee and customer experiences via text and voice channels.

7. Ripplr

A full-stack tech distribution and logistics startup called Ripplr provides plug-and-play technology and data-driven analytics.

8. Myelin Foundry

Myelin Foundry is a deep tech product start-up that creates AI algorithms using video, audio, and sensor data for edge devices to alter user experiences and business outcomes.

9. Arya.ai

Arya.ai is an AI startup that collaborates with other AI companies to discover quicker answers to difficult problems. The company provides services to the oil and gas, banking, insurance, and healthcare sectors.

10. Druva

In order to manage and protect company data across endpoint, data centre, and cloud workloads, Druva offers a SaaS-based platform.

Research and Academia

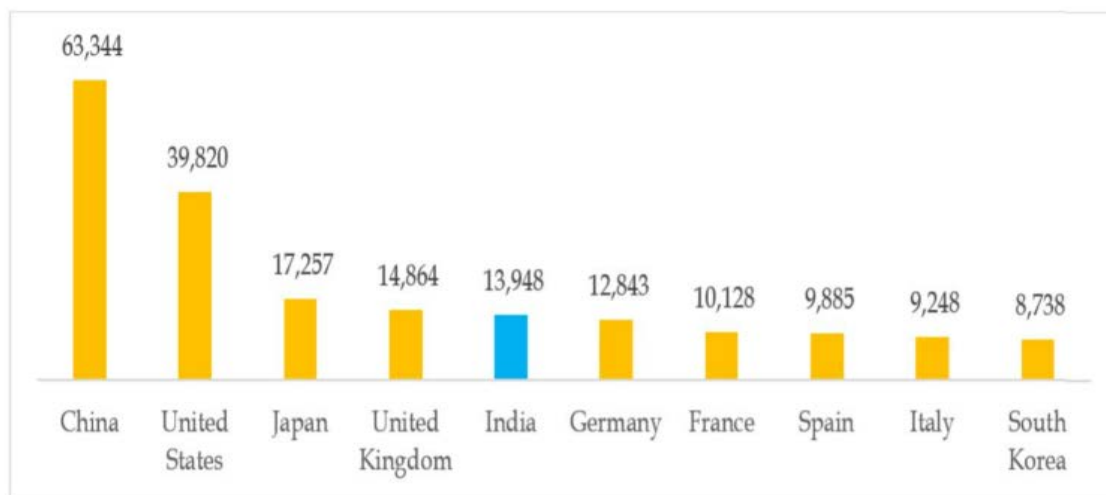
A collaborative strategy between the AI sector and academics is crucial for the technology to evolve and develop while generating new employment possibilities and, consequently, a competent workforce.

Indian universities and research institutions are actively engaged in AI research. Institutes like the Indian Institutes of Technology (IITs), Indian Statistical Institute (ISI), and Indian Institute of Science (IISc) are at the forefront of AI research and offer specialized courses and programs in AI and machine learning.

India hosts numerous conferences, workshops, and symposiums on AI and ML. These events bring together researchers, industry experts, and academicians to share their findings, discuss emerging trends, and collaborate on research projects. Some prominent conferences in India include the International Conference on Machine Learning (ICML), the Conference on Neural Information Processing Systems (NeurIPS), and the International Joint Conference on Artificial Intelligence (IJCAI).

India has 386 of a total of 22,000 PhD educated researchers worldwide and ranked 10th globally in research. India was ranked 13th globally, with 44 top-notch presenters at leading AI conferences globally. AI research concentrated mostly at institutes, like IITs, IIITs and IISc (indiascienceandtechnology.gov.in).

India in AI-related research and academics



Source: Scimago Journal & Country Rank (SJR)

Courtesy: [AI Trend story.pdf \(indiascienceandtechnology.gov.in\)](#)

AI adoption in industries

AI adoption in industries in India has been steadily growing in recent years. Various sectors are leveraging AI technologies to improve efficiency, enhance decision-making, and drive innovation. Here are some industries in India with their case studies where AI adoption is prominent:

- **Healthcare**

AI is transforming healthcare in India by enabling faster and more accurate diagnosis, personalized treatment plans, drug discovery, and telemedicine. AI-powered systems can analyze medical data, assist in surgical procedures, and support radiology and pathology diagnostics.

There have been successful case studies showcasing the adoption of AI in healthcare in India. Some of them include:

- * Niramai

Niramai is an Indian startup that uses AI to detect breast cancer at an early stage. Their solution, Thermalytix, uses a high-resolution thermal imaging device and an AI algorithm to analyze breast thermograms. Niramai's technology has been deployed in various hospitals and clinics across India, improving early detection and survival rates for breast cancer patients.

- * Wya

Wya is an AI-powered mental health chatbot developed by an Indian startup. It uses natural language processing and machine learning algorithms to have conversations with users and provide emotional support.

- * Tricog

Tricog is an AI-based platform that aims to improve cardiac care in India. It uses AI algorithms to analyze electrocardiogram (ECG) data and provide real-time interpretation.

- * Qure.ai

Qure.ai is an Indian startup that develops AI algorithms for medical imaging analysis. Their solutions cover a range of applications, including chest X-rays, head CT scans, and brain MRI scans. Qure.ai's algorithms can detect and diagnose various conditions, such as tuberculosis, intracranial bleeds, and lung diseases, with high accuracy.

- **Finance**

The finance industry is utilizing AI to automate processes, detect fraud, enhance risk management, and personalize customer experiences. AI algorithms analyze vast amounts

of financial data, identify patterns, and make predictions for better investment decisions. Some of the noteworthy AI platforms in finance include:

* Paytm

Paytm, India's leading digital payments platform, has leveraged AI to enhance fraud detection and prevention. The company uses machine learning algorithms to analyze transaction patterns, detect anomalies, and identify potentially fraudulent activities.

* HDFC Bank

HDFC Bank, one of India's largest private sector banks, has embraced AI to improve customer service and streamline operations. They have implemented an AI-powered chatbot called 'Eva' that interacts with customers, understands their queries, and provides relevant information and assistance.

* ICICI Lombard

ICICI Lombard, one of India's leading general insurance companies, has utilized AI for claim settlement and fraud detection. They employ computer vision techniques to assess vehicle damage and process motor insurance claims faster and more accurately.

* Axis Bank

Axis Bank has adopted AI for risk management and credit assessment. They use machine learning algorithms to analyze customer data, credit histories, and financial profiles to make accurate lending decisions.

* StockEdge

StockEdge, a popular investment research and analytics platform in India, utilizes AI for stock market analysis. The platform employs natural language processing (NLP) algorithms to process and analyze large volumes of financial news, corporate announcements, and social media sentiment.

● **Retail**

AI is revolutionizing the retail sector in India by offering personalized shopping experiences, demand forecasting, inventory management, and targeted marketing. AI-powered chatbots and virtual assistants are also employed to provide customer support and enhance online shopping experiences. Few of the successful AI based retail platforms include:

* BigBasket

BigBasket, one of India's largest online grocery stores, implements AI-based demand forecasting to optimize its inventory management. By analyzing historical data, customer

preferences, and external factors like weather conditions, AI algorithms helps BigBasket predict demand accurately.

* Myntra

Myntra, an online fashion retailer, implements AI for fashion recommendations and virtual try-on experiences. By analyzing customer data and browsing behavior, Myntra's AI algorithms suggested personalized fashion items to customers, increasing conversion rates and customer satisfaction.

* Shoppers Stop

Shoppers Stop, a leading department store chain, implements AI-based planogram optimization to enhance store layout and product placement. AI algorithms analyzed sales data, footfall patterns, and customer behavior to identify the optimal positioning of products within the store.

* Reliance Retail

Reliance Retail, a prominent retail conglomerate in India, has integrated AI across various aspects of its operations. They utilize AI for inventory management, demand forecasting, personalized recommendations, and customer analytics.

- **Manufacturing**

AI is transforming the manufacturing industry in India by enabling predictive maintenance, quality control, and supply chain optimization. AI-powered robots and automation systems are being deployed in factories to enhance productivity and reduce operational costs. AI adoption in manufacturing sectors in India include:

* Mahindra & Mahindra

Mahindra & Mahindra, one of India's leading automotive manufacturers, implemented AI and machine learning solutions in its manufacturing processes.

* Tata Steel

Tata Steel, one of the largest steel manufacturers in India, implements AI-based solutions to enhance its manufacturing processes. They use AI algorithms to analyze sensor data from their equipment and identify patterns that indicate equipment failures or maintenance needs.

* TVS Motor Company

TVS Motor Company, a leading two-wheeler manufacturer in India, integrates AI and IoT technologies into their manufacturing operations. They deploy AI-driven computer vision systems to automate quality control processes on the assembly line.

* Godrej Consumer Products Limited

Godrej Consumer Products Limited, a leading consumer goods manufacturer in India, embraces AI and machine learning in their manufacturing processes. They use AI-powered demand forecasting models to accurately predict consumer demand and optimize production accordingly.

• **Agriculture**

AI is being used in Indian agriculture to improve crop yield, optimize water usage, and monitor soil health. AI-powered systems analyze satellite imagery, weather data, and crop conditions to provide real-time insights and recommendations to farmers. Successful agricultural AI applications include

* CropIn Technology Solutions

CropIn is an Indian agri-tech company that leverages AI and data analytics to provide farm management solutions. Their platform enables farmers to make data-driven decisions for optimizing crop productivity and minimizing risks.

* Intello Labs

Intello Labs uses AI and computer vision technologies to assess the quality of agricultural produce. Their platform enables farmers, agribusinesses, and retailers to assess the quality parameters of fruits, vegetables, and grains through smartphone-based image analysis.

* SatSure: SatSure is an Indian startup that employs AI, satellite imagery, and IoT sensors for precision agriculture. Their solutions offer insights into soil health, crop health, and water management.

* RML AgTech

RML AgTech specializes in AI-based solutions for crop forecasting, pest management, and yield optimization.

* AgNext Technologies

AgNext focuses on providing quality assessment solutions for agricultural commodities using AI and spectroscopy.

• **Transportation**

The transportation sector in India is utilizing AI for traffic management, logistics optimization, and predictive maintenance of vehicles. AI-powered algorithms analyze traffic patterns, predict congestion, and optimize route planning to reduce travel time and fuel consumption.

AI implementation in the transportation sector in India:

* Delhi Metro

Delhi Metro, one of the largest metro rail networks in India, has employed AI-based technologies for optimizing its operations. The Delhi Metro Rail Corporation (DMRC) uses AI algorithms to analyze passenger flow patterns, predict crowd density, and optimize train schedules.

* HyperTrack

HyperTrack is an Indian startup that offers AI-powered location tracking and fleet management solutions. Their platform helps transportation companies track and monitor their vehicles in real-time, analyze historical data, and optimize routes and deliveries.

* Mahindra Logistics

Mahindra Logistics, a leading third-party logistics service provider in India, has incorporated AI technologies into its transportation operations. They utilize AI algorithms to optimize route planning, load consolidation, and vehicle utilization.

* Porter

Porter is an Indian logistics startup that employs AI for on-demand trucking services. Their platform connects customers with truck owners and drivers for efficient transportation of goods.

* Rivigo

Rivigo is an Indian logistics and transportation company that has pioneered the adoption of AI in the trucking industry. They have developed an AI-driven relay model where drivers switch between trucks at designated pit stops, ensuring continuous movement of goods and minimizing transit time.

- **Education**

AI is being employed in the education sector in India for personalized learning, adaptive assessments, and intelligent tutoring systems. AI algorithms analyze student performance data and provide tailored recommendations and feedback to enhance learning outcomes. India has witnessed several successful case studies where AI has been implemented in the education sector. Here are a few notable examples:

* Next Education's LearnNext

LearnNext, developed by Next Education, is an AI-powered learning solution that provides personalized and adaptive learning experiences to students. It uses machine

learning algorithms to understand the learning patterns and preferences of individual students, tailoring the content and pacing of lessons accordingly.

* BYJU'S

BYJU'S, an Indian edtech company, has integrated AI technology into its learning app to deliver personalized learning experiences. The app uses AI algorithms to analyze student performance and provide tailored recommendations and adaptive learning paths.

* ExtraMarks

ExtraMarks is an e-learning platform in India that uses AI to enhance the learning experience. It offers adaptive learning modules, virtual classes, and interactive study materials across various subjects and grade levels.

* Simplilearn

Simplilearn is an online learning platform that offers professional certification courses. It leverages AI technology to provide adaptive learning paths, interactive simulations, and personalized feedback to learners.

* Eckovation

Eckovation is an AI-enabled social learning platform that connects students and educators across India. It utilizes AI algorithms to match learners with suitable study groups, mentors, and educational resources based on their interests and learning needs.

- **Energy**

The energy industry in India is leveraging AI for smart grid management, energy optimization, and renewable energy integration. AI algorithms analyze energy consumption patterns and optimize energy distribution for efficient and sustainable operations. Here are some successful case studies highlighting the implementation of AI in energy in India:

* Power System Optimization

Power Grid Corporation of India Ltd (PGCIL), the country's largest electric power transmission utility, has implemented AI-based technology to optimize power system operations.

* Solar Power Plant Performance Monitoring

Azure Power, one of India's leading solar power producers, has deployed AI-based monitoring systems in its solar farms.

* Energy Demand Forecasting

Tata Power Delhi Distribution Limited (Tata Power-DDL), a major power distribution company in the capital city, implemented AI-based demand forecasting models.

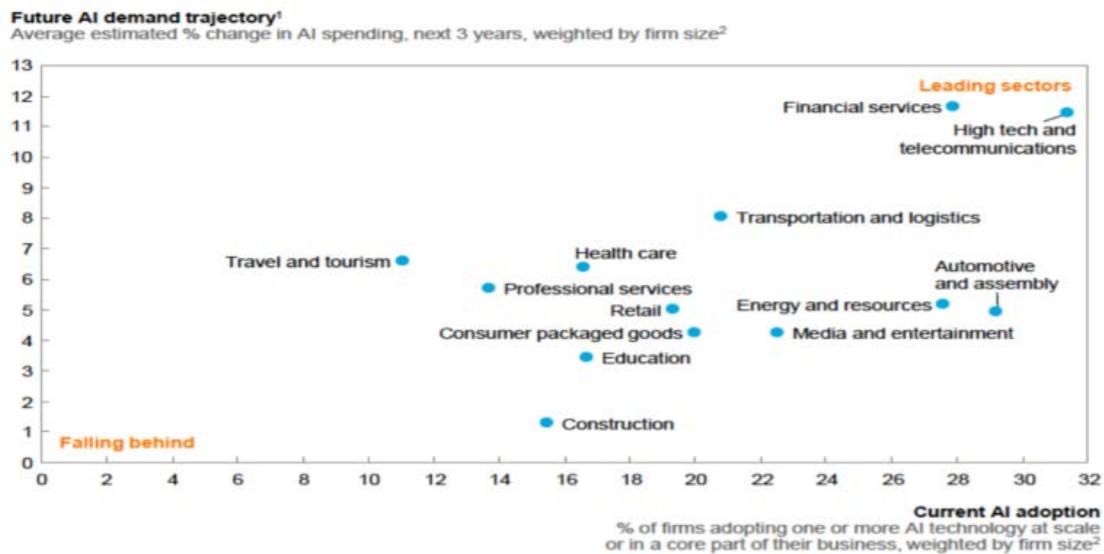
*** Energy Efficiency in Buildings**

AI-based energy management systems have been deployed in commercial and residential buildings across India. For example, Honeywell implemented its Forge Energy Optimization solution in the ITC Green Centre, a sustainable office building in Gurgaon.

*** Smart Grid Integration**

The Smart Grid Knowledge Laboratory (SGKL) project aims to develop AI-driven solutions for smart grid management. The project focuses on integrating distributed energy resources, such as solar panels and battery storage, with the power grid.

AI adoption across sectors



Source: NITI Aayog

Courtesy: [AI Trend story.pdf \(indiascienceandtechnology.gov.in\)](https://www.indiascienceandtechnology.gov.in)

Top Indian AI companies

Intelligent systems that can analyze and interpret enormous volumes of data, automate repetitive operations, and make wise decisions are being developed using AI technologies including machine learning, natural language processing, and computer vision. The increasing adoption of AI is being driven by the demand for efficacy, accuracy, and cost-efficiency.

Top Listed AI Companies in India (Best Artificial Intelligence Stocks in India 2023 (groww.in))

1. Tata Elxsi Ltd.
2. Bosch Ltd.
3. Kellton Tech Solutions Ltd.
4. Happiest Minds Technologies Ltd.
5. Zensar Technologies Ltd.
6. Persistent Systems Ltd.
7. Saksoft Ltd.
8. Oracle Financial Services Software Ltd.
9. Affle India Ltd.
10. Cyient Ltd

Top AI Stocks in India

Stock	Market Cap in Cr	ROE	Net Profit Margin
Tata Elxsi	39,131	37.23	22.25%
Affle	12,529	28	19.85%
Kellton Tech Solutions	514.32	15.74	8.36%
Oracle	28,581	27.69	36.17%
Happiest Minds	11,860	30.09	16.57%
Persistent Systems	33,552	23	12.09%
Cyient	11,830	17.31	11.52
Bosch	55,761	11.88	10.33

Courtesy: Top Artificial Intelligence Stocks in India - Best AI Stocks in 2023 (tradebrains.in)

AI in India: Opportunities

The widespread adoption of AI in everyday operations is being driven by rising technology investments, increased internet usage, and improvements in the entire digital infrastructure.

The global AI market was close to \$59.67 billion in 2021, and it is anticipated to increase at a CAGR of 39.4% to reach close to \$422.37 billion by 2028. The AI market in India is anticipated to develop at a CAGR of 20.2%, from \$3.1 billion in 2020 to \$7.8 billion by 2025, according to the International Data Corporation (IDC).

A number of employment opportunities have emerged as a result of the development of generative AI, and according to a study by the job search website Indeed, there has been a 158% increase in job postings in this field in India over the past five years. According to the survey, job searches for generative AI and huge language models increased by over 89% in March 2023 compared to the same month in 2018.

The data is released at a time when rumors exist over the likelihood that occupations may be mechanized with the sudden appearance of AI.

According to Goldman Sachs research, 26% of jobs at work in various industries may be automated. The generative AI has advanced capabilities in the creative and marketing industries, according to the Harvard Business Review.

Nevertheless, according to the World Economic Forum's (WEF) Future of Jobs report, AI will give rise to important jobs like those for machine learning experts, scientists, data analysts, and digital transformation specialists.

India-Taiwan AI collaboration initiatives

- The Indo-Taiwan Joint Research Centre on AI

The Indo-Taiwan Joint Research Centre on Artificial Intelligence and Machine Learning is a bilateral, non-profit, industry and academic research center at IIT Ropar that was founded in collaboration with Taiwan's overseas science and technology innovation center. It serves as a platform for collaboration and innovation in artificial intelligence between India and Taiwan. The shared goal is to create an academic environment that will enhance the basis for research on significant applications, perform AI and ML research, encourage student and faculty interaction, and act as a platform for incubation.

The center's goals are to promote global education in Artificial Intelligence, Academia-Industry Manufacturing Innovations, Fintech and Smart Cities, and Skill-Training & Technology Innovations in Image Analysis, Text Mining, and Big Data, etc. The center engages in educational activities as well as business prospects, consulting for smart industrial technologies, technical exchange, and talent development.

- India-Taiwan Collaborative Project

Taiwan and India worked together to build innovative smart pandemic prevention technology during the Covid-19 pandemic. In July 2020, the Taipei Economic and Cultural Center (TECC) and Taiwan Education Center (TEC) invited the Taiwan-India Joint Research Center on Artificial Intelligence organized by the National Chung Cheng University (CCU) and IIT Ropar along with the Sri Ramaswamy Memorial Institute of Science and Technology (SRM IST) to jointly create a Smart Pandemic Prevention System (SPPS) which was deployed on the campuses of both CCU and SRM IST.

Four key components make up the Taiwan-India Smart Pandemic Prevention System: automatic body monitoring and recording, smart face identification, face mask recognition, and social contact analysis. Students from CCU and SRM collaborated to implement the newest AI technology on both campuses, benefiting staff members at both colleges by providing secure entry and departure points.

CONCLUSION

India focuses on creating AI tools for the poor world because it sees AI as a tool for social inclusion and empowerment. India's AI strategy is firmly rooted in ethical AI concepts and tries to ensure that comparable provisions are made in international frameworks.