AI, Applied

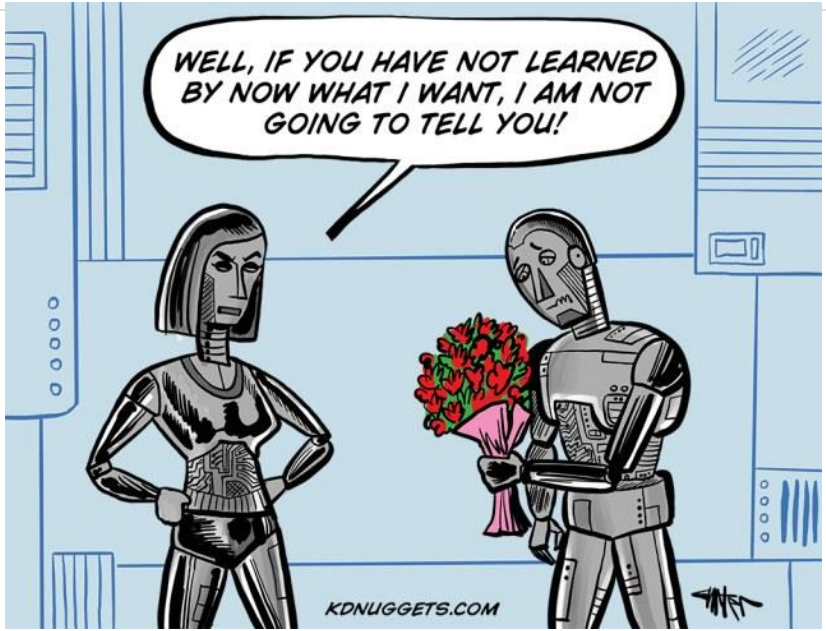
Contemporary uses & cases

Prof. Ramesh Loganathan, IIIT Hyderabad

Speaking at MCRHRD

Feb 2020

Learning is at core of Human Intelligence

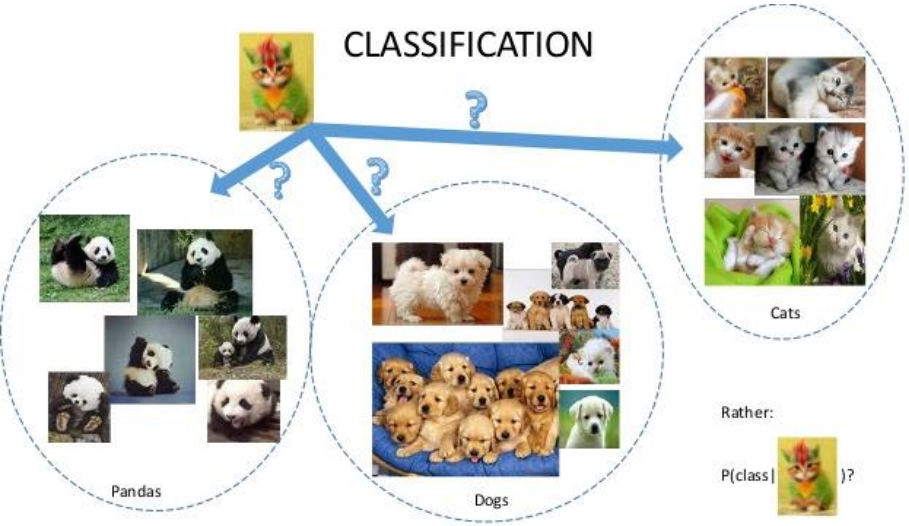


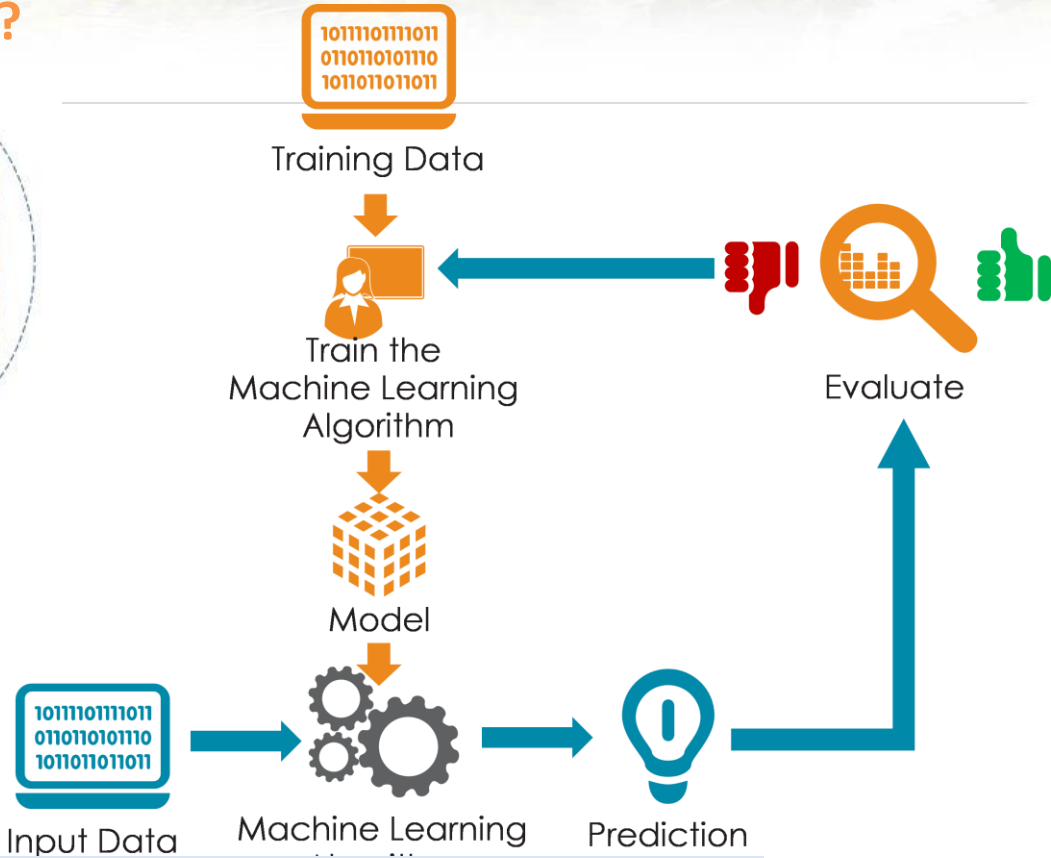
Children learn languages just like that. By ‘observing’.

- That’s exactly kind of behavior that we are trying to teach to machines. We are trying to teach machines to ***“Learn from Experience”***.

Machine *learning*.. Core to AI!

How does Comp Vision ML work?

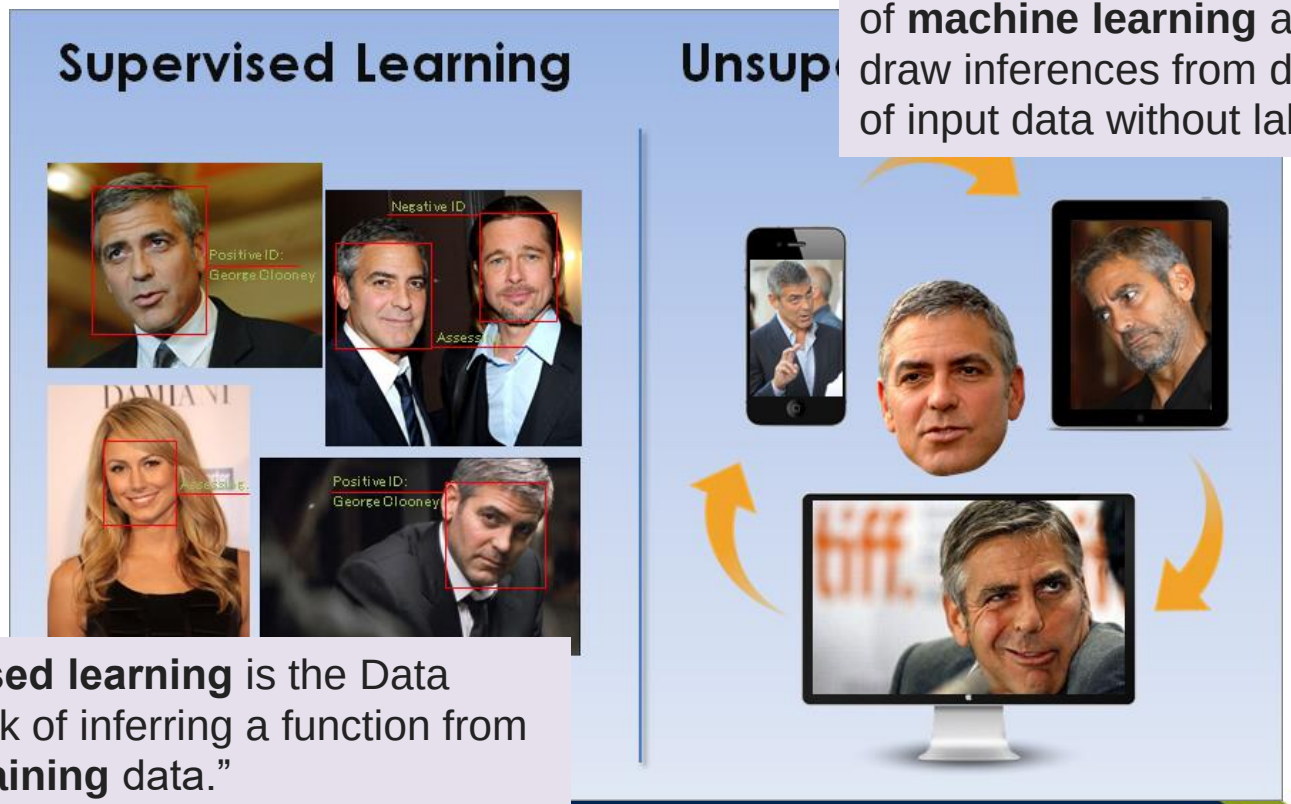




Different types of Machine Learning…

Past Data is used for Machine Learning

Unsupervised learning is a type of **machine learning** algorithm used to draw inferences from datasets consisting of input data without labeled responses.



"Supervised learning is the Data mining task of inferring a function from labeled **training** data."

Reinforcement Learning
Learning from mistakes

Reinforcement learning is a *hit and trial* method of learning. The machine learns good (Reward) or not good (Penalty) for each action it performs.

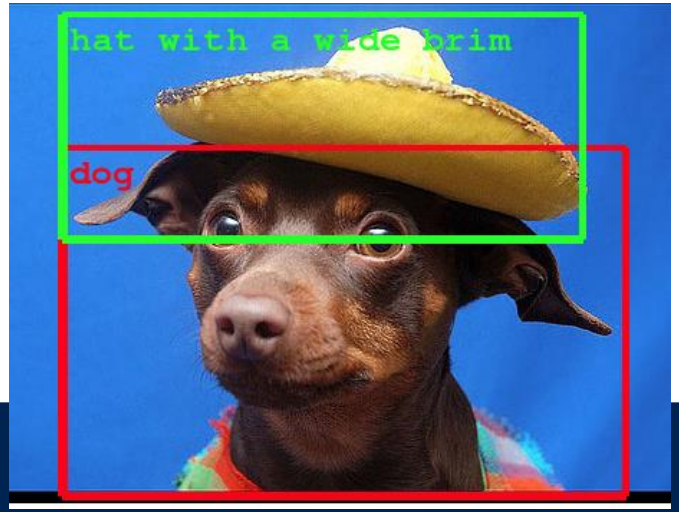
We learn from mistakes

Deep Learning

Deep learning is a **machine learning** technique that teaches computers to learn by example

Examples:
Colorization of Black and White Images.
Object Classification in Photographs.
Image Caption Generation.

"man in black shirt is playing guitar."



IIIT Hyderabad's Research group on AI

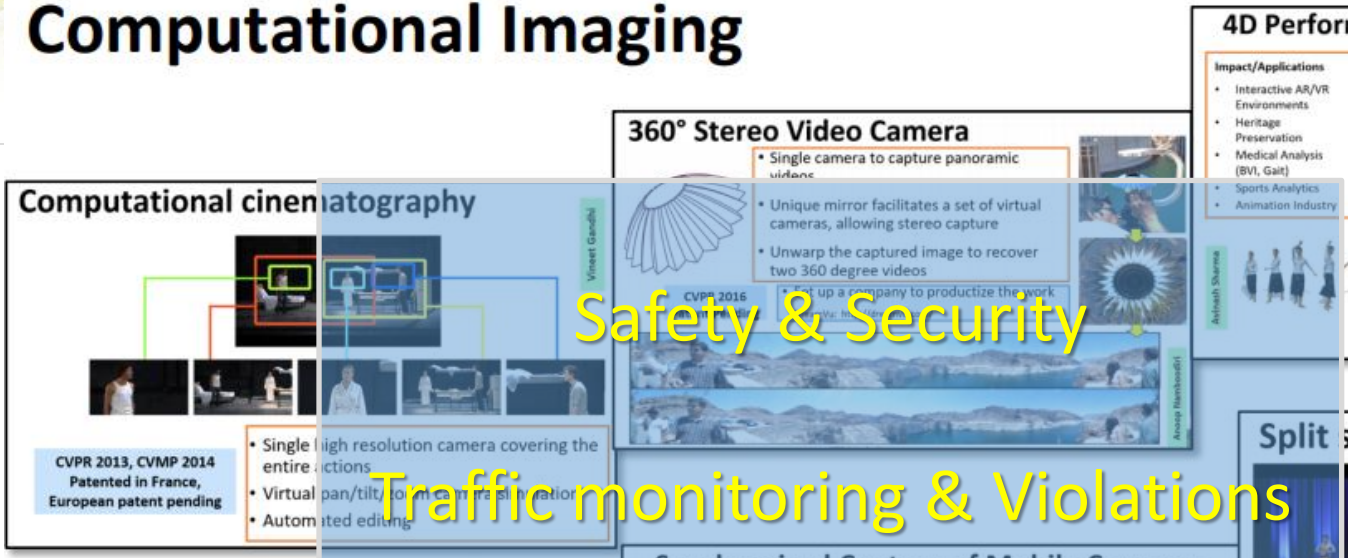
Technology research centers

Domain research centers

Visual Information & Technology	Language Technology /NLP	Software Engineering	VLSI & Embedded Systems	Data Engineering
Robotics	Signal Processing & Comm	Security, Theory and Algorithms	IT for Agriculture & Rural Development	IT for Building Science
Computational Nat Sci & Bioinformatics	IT in Education	Earthquake Engg	Cognitive Science	Exact Humanities
Systems Group	IT in eGov	IT in Building Sciences	Speech	ML

Largest Artificial Intelligence (AI) Research group in the country. Leading for Comp Vision & NLP

Computational Imaging



Safety & Security

Traffic monitoring & Violations

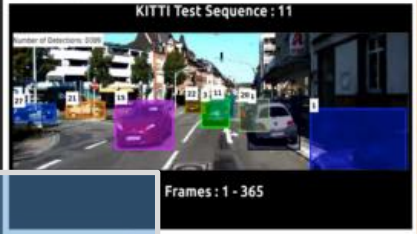
Road conditions

Robotics

Autonomous driving on campus roads

Autonomous Mapping for a Payload Carrying Drone

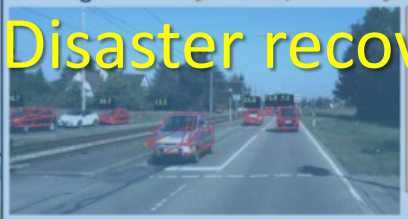
Driver Assistance: Tracking Moving Vehicles in Cluttered Traffic



- Extremely difficult to get consistent tracks of vehicles
- Handles occlusions seamlessly
- 3rd best solution in the world currently on KITTI dataset
- 1st among universities on KITTI dataset

K Madhava Krishna

Driver Assistance: Single Camera Reconstruction of Moving Vehicles [ICRA 17, IROS 17]

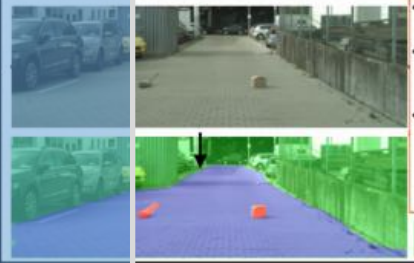


- Very Difficult Problem, [illegible]
- Typical solutions involve 3D range sensors
- Single camera a viable alternative.
- Currently best results on KITTI datasets

The numbers on top of the car in yellow indicate depth as estimated by a single camera
3D reconstruction shown as wireframes in RED

K Madhava Krishna

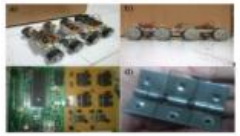
Small obstacle detection



- Autonomous driving in Indian conditions
- Semantic segmentation trained from just 100 images
- Our solution beats the benchmarks set by Daimler on their dataset

Vineet Gandhi, Madhav Krishna — ICRA 2018 (submitted)

Novel Robotic Mechanisms: [ICRA'14, 17, IROS'1



- Can climb steep vertical obstacle
- Can climb stairs
- Can detach itself to become multiple robots on a level plane
- Can attach itself to become a stair climber
- Technology transferred to DRDO lab

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Demining Robot

Disaster recovery

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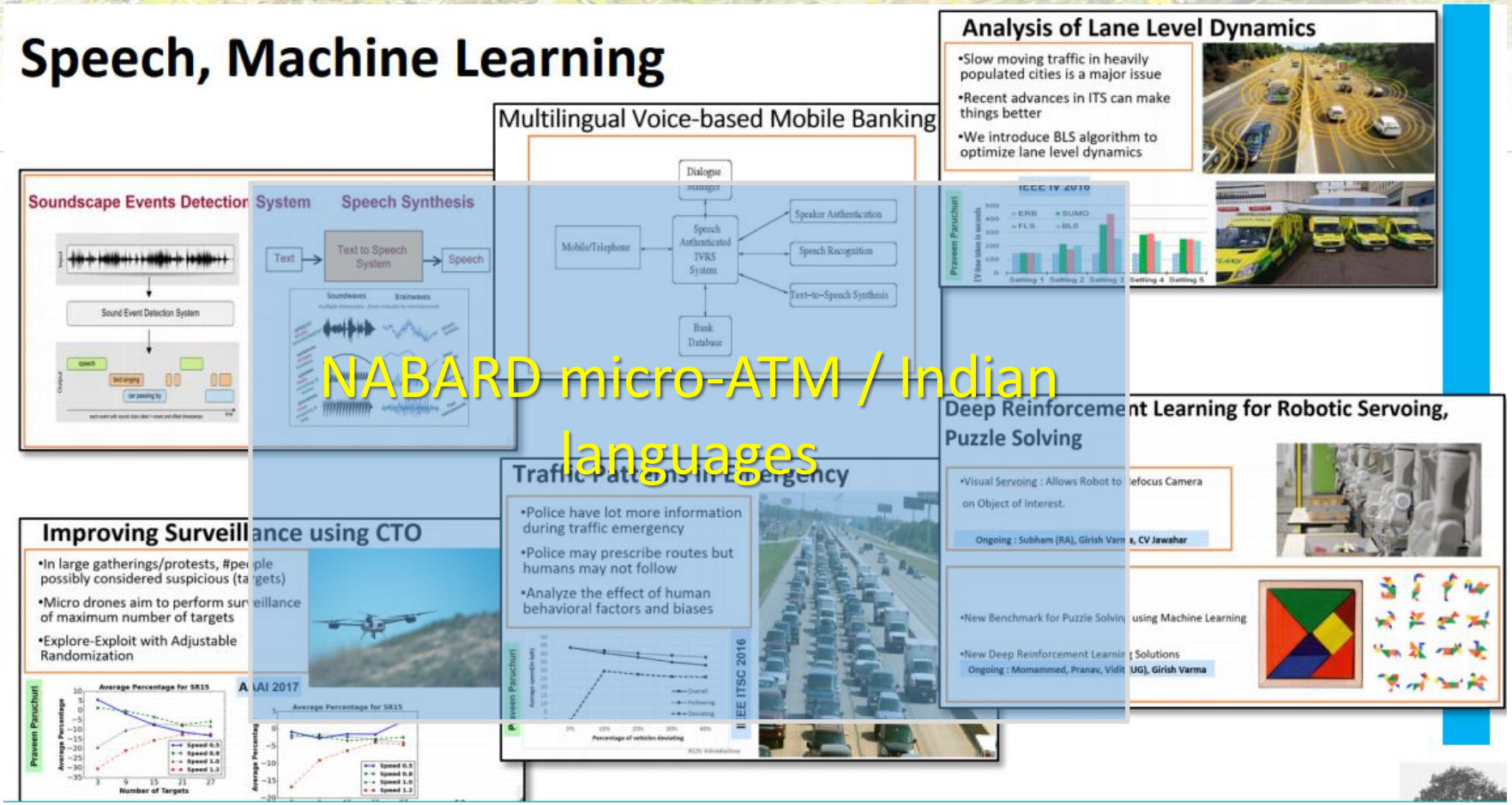
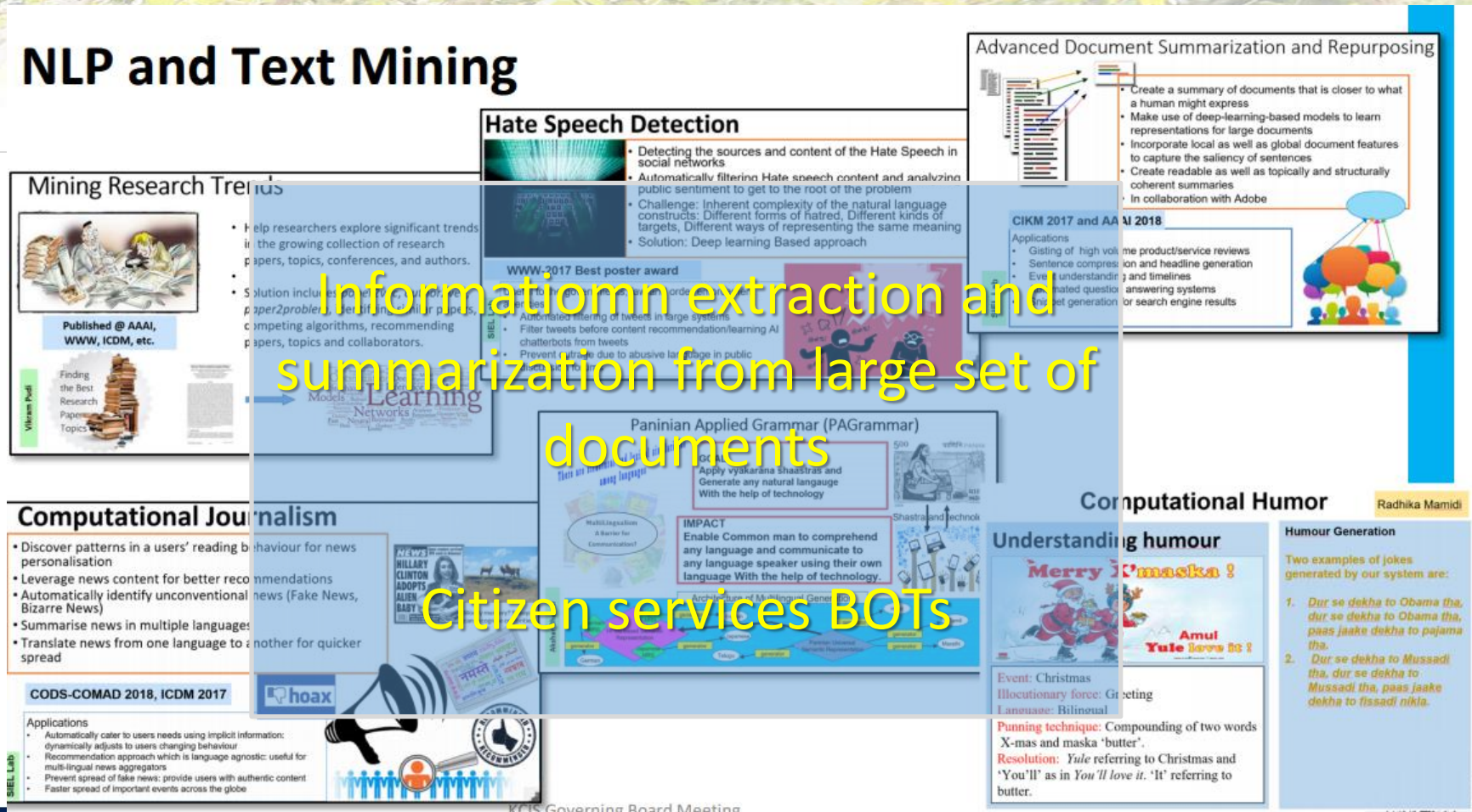
CIE ACCELERATING DEEP TECH

Speech, Machine Learning



NLP and Text Mining

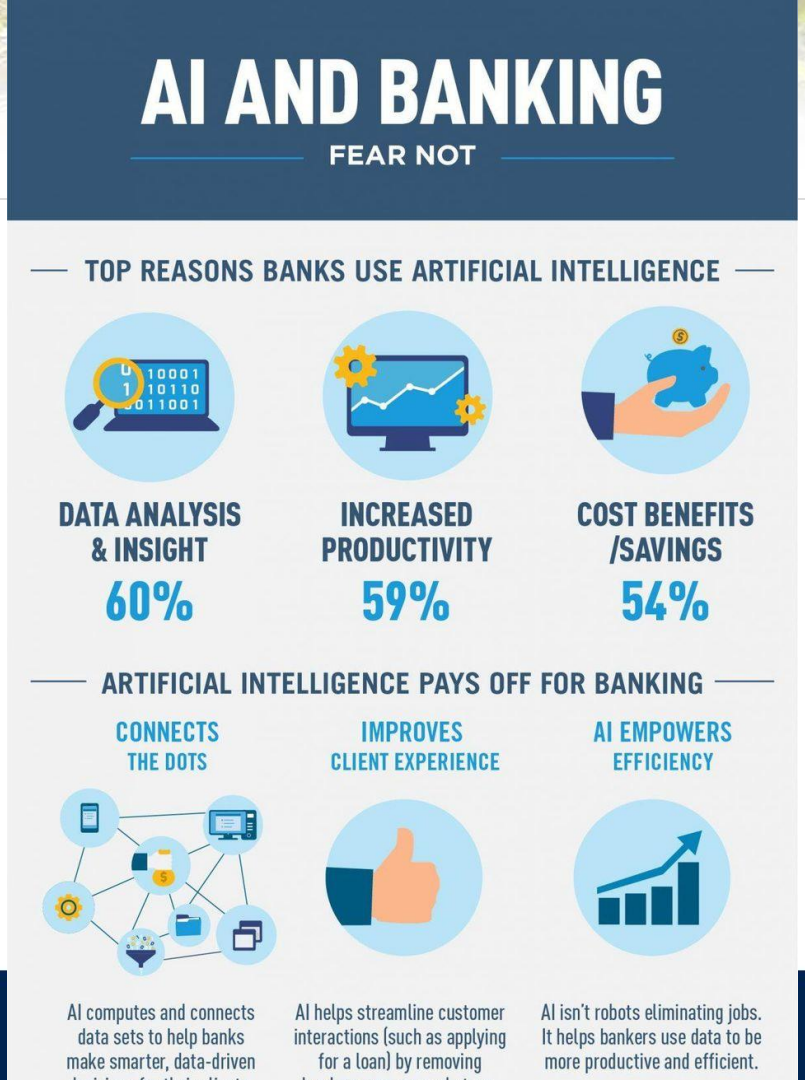


Informatiomn extraction and summarization from large set of documents

Citizen services BOTs

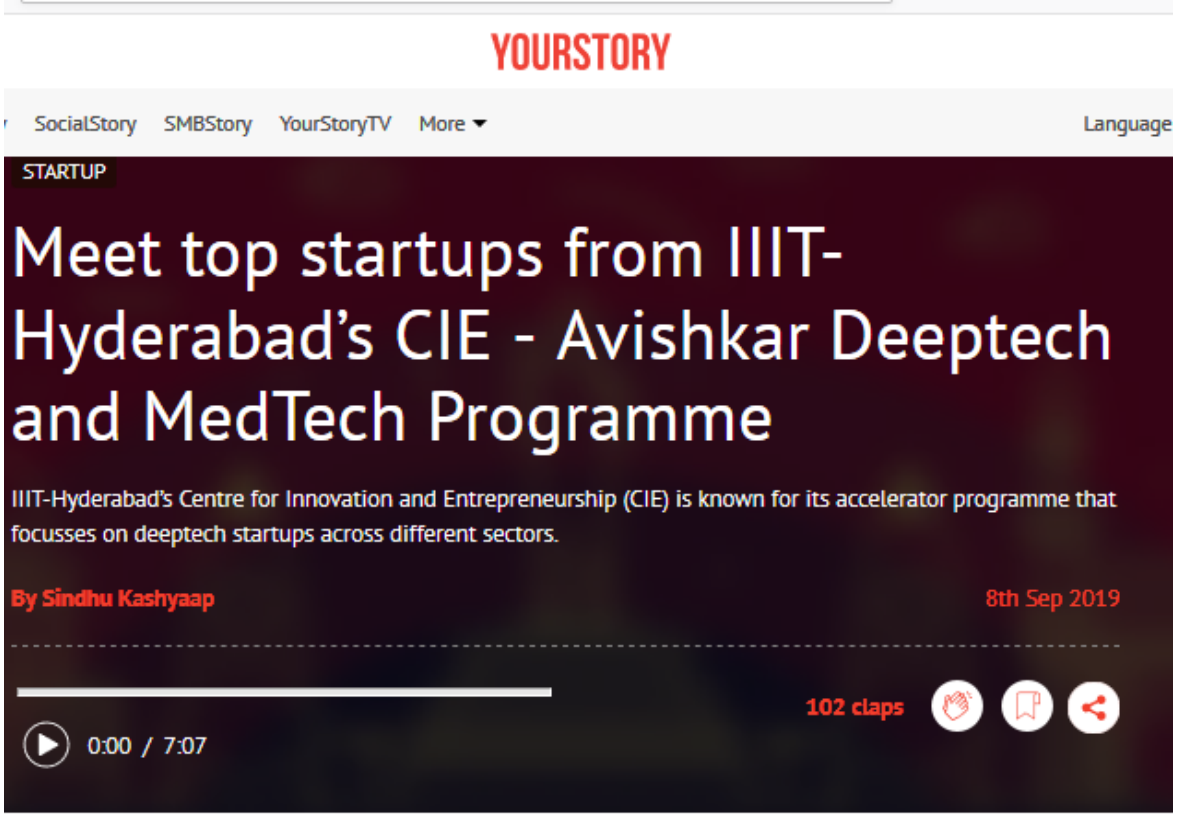
Every sector has AI applications

Financial..Banks



- SOP quick ref
- Credit scoring
- KYC
  Loan processing

SNEAK PEEK INTO AI & ML STARTUPS AT IIITH



The Centre for Innovation and Entrepreneurship (CIE) cell of IIIT-Hyderabad has announced **the success of the eighth cohort of Avishkar Deeptech and Medtech Accelerator Programme.** Every year, the programme shortlists a few startups and offers them with mentorship and support.

Medical ..

Onward Health

- Automating medical diagnostics. Starting with Oncology Histopathology

Docturnal

- Diagnosing from the sound of cough. Started with TB.

Rady8

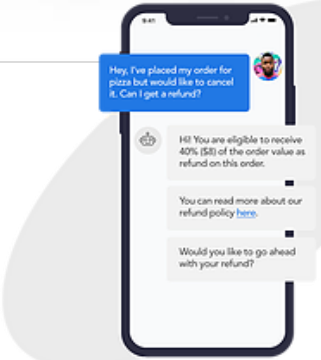
- Tele diagnostic and eye health reports using a mobile based solution

Servicing customers

Scholr

Scholr is an academic platform to get most accurate solutions to all academic questions. Get instant answers to questions from homework, assignment and ...

Answerwise



- AI Powered Customer Service
- ..existing helpdesk and CRM systems to provide instant query resolutions,

DAVE.AI

DAVE

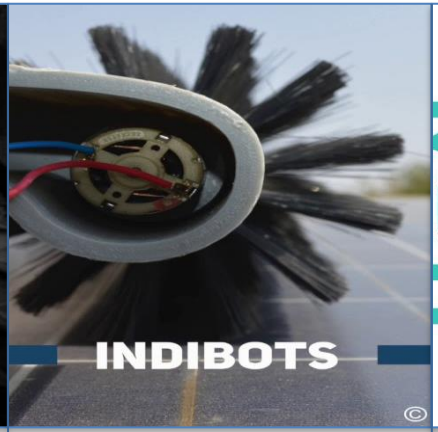
Customer information chat bots

Listen. Speak. Decide.

CyberPhysical systems..

Xmachines

- Robotic vehicle platform for custom solutions



Indibots

- Solar panel cleaning robot

Altor

- Smart helmets

Thanos.. Pesticide spraying

- Drone based solution. To leverage CV to identify exactly where pests are

Healthcare

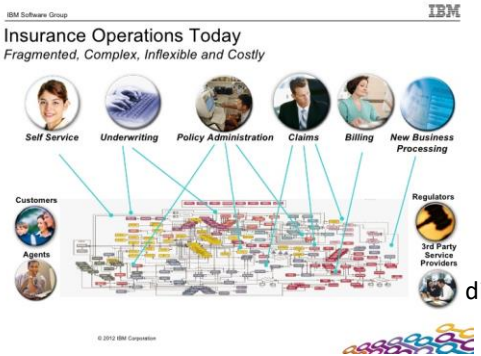
Nexrea

AR & AI powered sales & service solution for Medical equipment

logy.AI

Intelligence in Pathology- to improve pathology workflow. Starting with cervical cancer

Logy.ai



Automatically process images, Extracting discharge summaries and text from reports

Insurance claim processing

Nano health

Manage chronic diseases like diabetes, hypertension through a health coach tech

NanoHealth

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Co-creating deep-IP startups, imperative to bring more tech to market

Thanks

Ramesh.Loganathan@iiit.ac.in

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‘Creation’

1. Reenacting politicians

A group from the University of Washington created a system that uses audio and synthesizes it with lip motion of a face in a video. The video shows quite a striking example of Obama. Here is the original paper.

PM, speaking .Mann Ki Bath’ in 15 Indian languages

2. Restore colors in B&W photos and videos

Don't like black and white images? No worries, "Let there be color!" is a computer system that can automatically restore colors in B&W photos. You can read more about it here and see plenty other examples here.

This is the crazy face-aging app that’s taking social media by storm

Andy Meek @aemeek
July 17th, 2019 at 12:53 PM

Share Tweet

If you’ve opened any of your social media accounts over the past several days, you’ve no doubt seen a procession of old, wrinkled yet slightly familiar-looking faces taking over your feed.

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Areas of healthcare that AIML TIH will enable

- Diagnostics
  - New algorithms/techniques for diagnostics
  - Point of care diagnostics (remote/tele)
  - Precision diagnostics
  - Low cost / rapid disgnostics

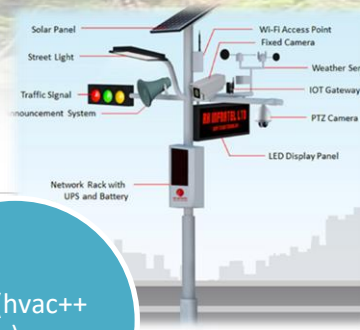
- Proactive (Preventive++) public health
  - Risk profiling & 360 degree view of data
  - Data based targeted preventive measures
  - Predicting outcome of health initiatives
  - Contributory effects of broader Ecosystem

- Health service optimization
  - Ayushman/Arogyasri insurance service optimization
  - People & Facility use optimizations
  - Supply chain optimizations (medicines, ..)
  - Asha workers' efficacies

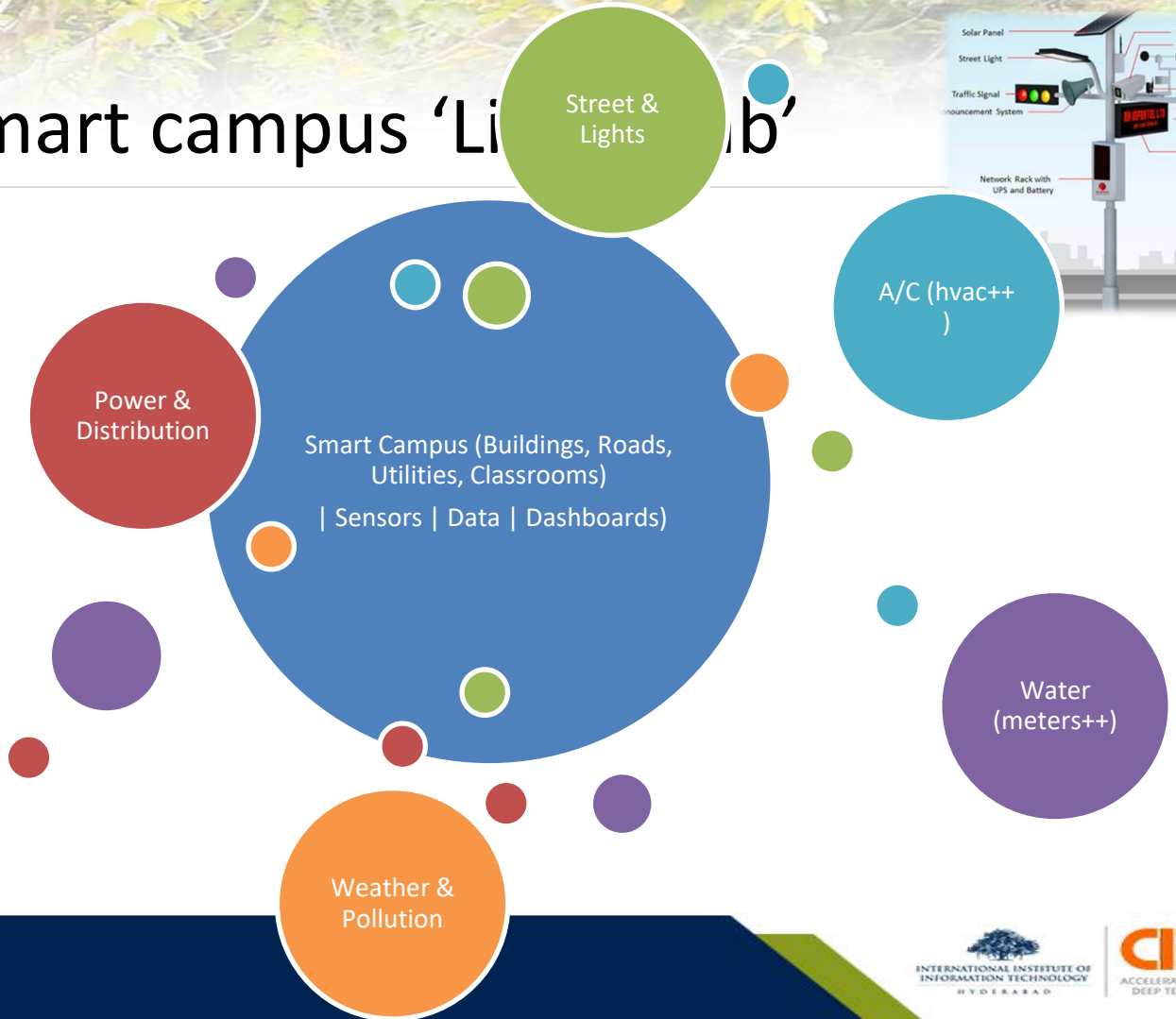
- Treatment protocols discovery
  - New treatment models From data (Thru understanding disease mechanism, biomarkers, other data)
  - Multi-sensor based treatment models
  - Models from Genomics /other data
  - Bio/Chemistry models

- Person/village specific 360 degree health & social strategy
  - Culture/geo specific interventions
  - Equitable benefits distribution
  - Vulnerable groups
  - Insights from seemingly unconnected datasets (poverty, NFHS, census, DLHS, literacy)

Smart campus ‘Li b’



- The campus will be wired
  - ‘Living’ demo setup
    - Smart campus. Smart poles.
  - Network/Utilities:
    - For research & startups
  - Data- with models
    - Per OneM2M standards
  - Living Lab: POCs
- Plan: Phase 1: Dec 2019



Domian #4-

Strategic sector (Defence++)

- Artificial intelligence is now an essential component of defence and security strategies globally — from combat systems to operational processes. It is essential for india to harness the potential of AI to transform all functions in an affordable, effective, and enhance speed of defense operations.
- The use cases for AI in defense and internal security are many fold. AI can be embedded into weapons and surveillance systems to enhance performance. It can be used to improve target recognition, combat simulation and training, and threat monitoring. It can be used in logistics and transportation systems, to help the military get the right equipment and people to the right places at the right time.

Computer Vision & Geo Information Systems

- Telemedicine applications for remote deployments
- Object detection and tracking
- Scene abnormality detection and alarm management
- Face detection and tracking
- Large area surveillance and tracking (crowds)
- Soldier training and performance monitoring
- Abnormalities in terrains (sudden constructions)

Robotics/ Autonomous Vehicles

- Drone & robot based inspection
- Asset / terrain mapping and tracking
- Robots for combing & terror operations
- Rescue and disaster assistance
- Supplies and equipment parts delivery drones
- Landmine avoidance : Pilot robots
- Obstacle detection and removal

Language Technologies & Signal Processing

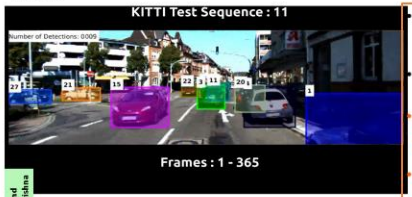
- Manuals and Legal document querying
- International document language conversion
- Training and development
- Speech in noisy conditions
- Sound signal analysis – equipment diagnostics
- Lab on chip for rapid analysis of pathogens
- Speech enabled actuation – local languages
- Cameras on the edge

Data Sciences , Analytics & Security

- Patterns from soldier information – behavior anomalies
- Blockchain enabled army records
- Cyber attack modeling and detection
- Insider threat monitoring : access pattern analysis
- Vehicle and Equipment Failure data analysis and prediction
- Prediction and Forecasting of incidents from past data and events

Indicative products, from Robotics

Driver Assistance: Tracking Moving Vehicles in Cluttered Traffic



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- **1st among universities** on KITTI dataset

Submitted to ICRA 2018

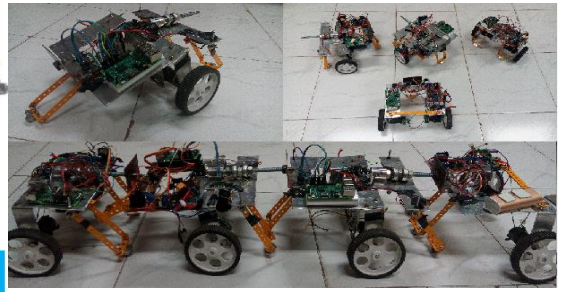
Students and K Madhava Krishna

Micro Air Vehicle Initiatives: Environmental Audit [ICRA 16, 17]

Pomegranate Yield Estimation with MAV [DeitY]

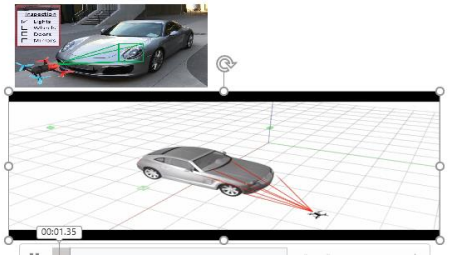
- Using drones to count fruits in orchards, trees in a vegetation
- Localizing trees with GPS coordinates
- Working towards automating the drone for such audit tasks
- Immense potential in forestry and agriculture
- Two patents pending

Students and K Madhava Krishnac



Stair and pipe climbing robots

Automated Parts Inspection



Self Driving Car Development

Obstacle avoidance maneuver of self driving car in collaboration with a major private company

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Senses

Restoring touch

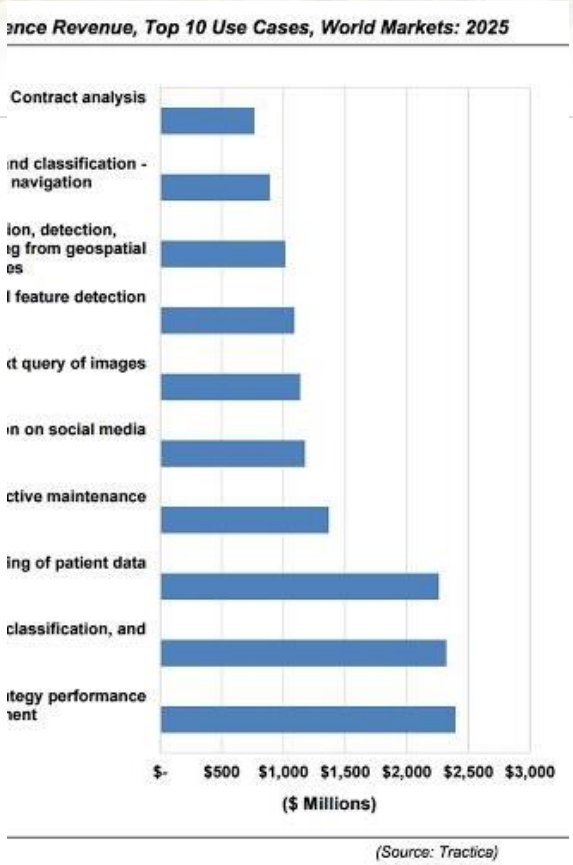
In a landmark event announced Thursday, researchers revealed that a paralyzed man's feelings of touch were restored with a mind-controlled robotic arm and brain chip implants. [Bionic Humans: Top 10 Technologies]

Customer service calls- Abusive Language and Anger

HUMOR
SARCASM

Where next

7:53
39.4 K/s
88%
Google
ai in 2025
ALL
NEWS
IMAGES
VIDEOS
MAPS
SHOPPING
The artificial intelligence market is forecasted by Research and Markets to grow to USD 191 Billion by 2025 from USD 21 Billion in 2018, at a CAGR of 36.62% during the forecast period. ... China is investing tens of billions into AI. These larger investments should accelerate the growth and adoption of AI.
https://www.nextbigfuture.com › ...
$191 billion estimate for global AI in 2025 could be an underestimation ...
About this result
Feedback
VIDEOS
View all


ence Revenue, Top 10 Use Cases, World Markets: 2025
Contract analysis
nd classification - navigation
ion, detection, g from geospatial es
l feature detection
t query of images
n on social media
ctive maintenance
ing of patient data
classification, and
tegy performance ent
$-
$500
$1,000
$1,500
$2,000
$2,500
$3,000
($ Millions)
(Source: Tractica)

Cognitive Science, Others

360° Display: Cognitive Ergonomic Study

- Developed 360-degree virtual simulation
- Assess tele/ remote spatial awareness, Local Area Awareness (LAA) and Local Situation Awareness (LSA) Challenges using desktop & VR 360-degree displays
- Develop Cognitive – Ergonomic Profile and Battery for testing dynamic environments
- Develop Training Protocols

Supported by INMAS, DRDO and DST funding

Priyanka Shirsat

Structural and functional brain-markers that predict rehabilitation success

In collaboration with National Institute of Psychiatry, Mexico
Symbiosis Institute of Technology

Vinoo Alluri

Deep Learning with Music

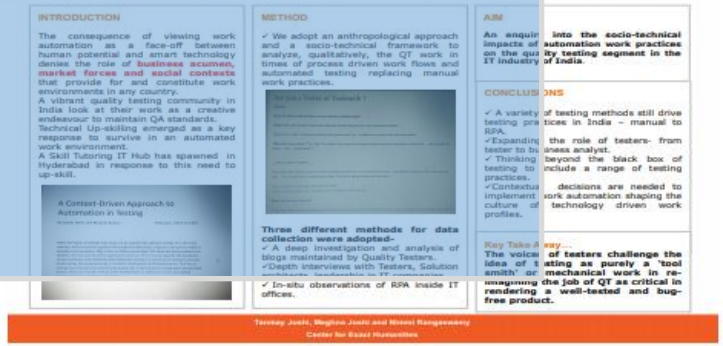
Can we classify "musicality" based on brain data (sMRI + fMRI)?

Vinoo Alluri

Truck drivers safety

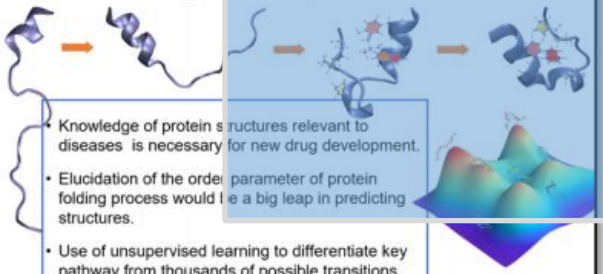
Socio-Technical System of Quality Testing in India

R&D SHOWCASE



Tanmay Joshi, Meghna Joshi and Nimmi Rangaswamy
Center for Exact Humanities

Protein Folding: Learning the Order Parameter



- Knowledge of protein structures relevant to diseases is necessary for new drug development.
- Elucidation of the order parameter of protein folding process would be a big leap in predicting structures.
- Use of unsupervised learning to differentiate key pathway from thousands of possible transitions.

JACS 2017, in press; JCTC 2016, 5190; Biochem. 2016, 5653; JPCB 2015, 3755

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