

# Artificial Intelligence and Machine Learning

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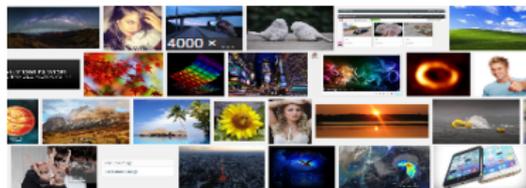
Full Professor (CSE)

IEEE Fellow

Machine learning, Artificial intelligence

- **Associate Editors:** IEEE Transactions on Neural Networks and Learning Systems / Neural Networks / Neurocomputing / International Journal of Data Science and Analytics
- **Area Chairs** of major machine learning / AI conferences including NeurIPS/NIPS, ICML, ICLR, IJCAI, AAI, ECML
- **Vice President**, Asia Pacific Neural Network Society
- **Most Influential Scholar Award Honorable Mention** (for outstanding and vibrant contributions to the field of AAI/IJCAI between 2009 and 2019)

# AI is Everywhere



(a) image processing



(b) natural language processing



(c) speech recognition

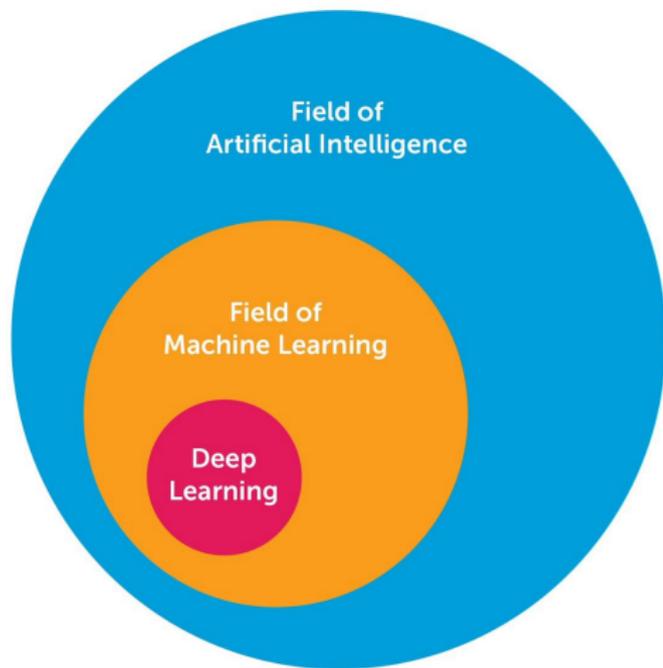


(d) game playing

AI as National Strategy in China

新一代人工智能产业三年行动计划(2018-2020)

by 2030: China become the **world's premier AI innovation center**



# Research Interests

## Learning paradigms

- supervised learning, unsupervised learning, reinforcement learning, semi-supervised learning, self-supervised learning, ...
- multiclass / multilabel / multi-instance / multitask ...

## Machine learning models

- deep networks, support vector machines, Bayesian models, ...

## Learning from high-dimensional data

- dimension reduction, sparse learning, metric learning, manifold learning, ...

# Research Interests...

## Learning from big data

- scalable machine learning algorithms, online learning, ...

## Learning from small samples

- transfer learning, few-shot learning, active learning, data augmentation, meta-learning ...

## Different types of data

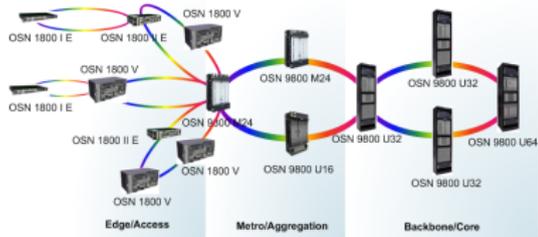
- timeseries, images, multispectral images, graph-structured data (networks), ...

## Different types of platforms

- single machine, distributed machine learning

# AI/ML in Networking

*Huawei*



- use AI/ML to improve network performance

- anti-money laundering

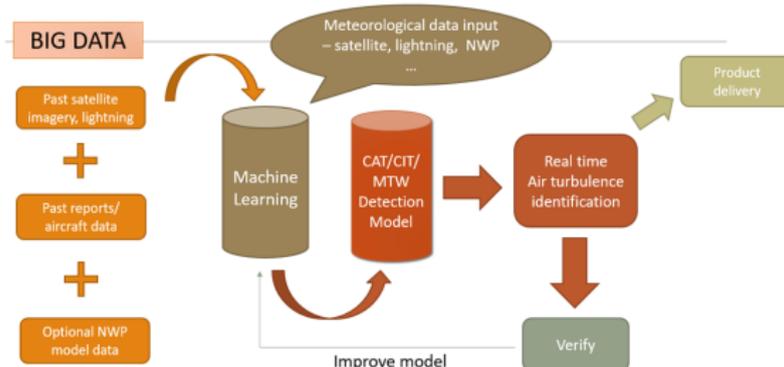
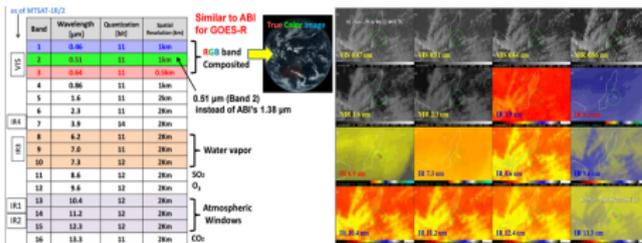
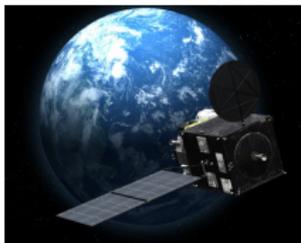


- almost all existing systems are rule-based
  - Alert if “in past 5 days, customer has at least HKD500,000 wired-in” **AND** “total withdrawn amount is 90-110% of total wired-in amount” **AND** “current day withdrawal is at least HKD100,000”
- significant improvement by using AI/ML

# AI/ML in Environment

## Hong Kong Observatory and Hong Kong Airport Authority

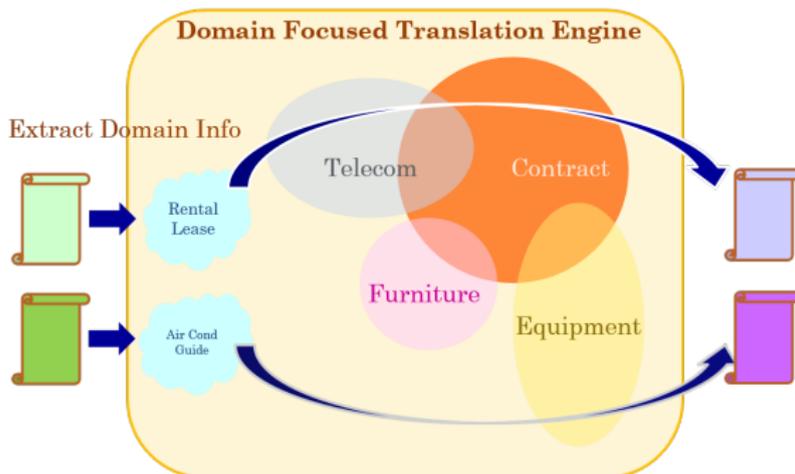
- detect upper air **aviation turbulence** based on multispectral satellite imageries and aircraft data



# AI/ML in Language Processing

## *Logistics and Supply Chain MultiTech R&D Centre*

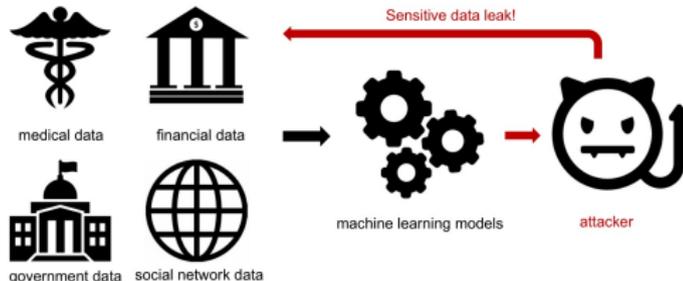
- Hong Kong to become the arbitration venue under “One Belt One Road” → legal documents
- **neural machine translation**



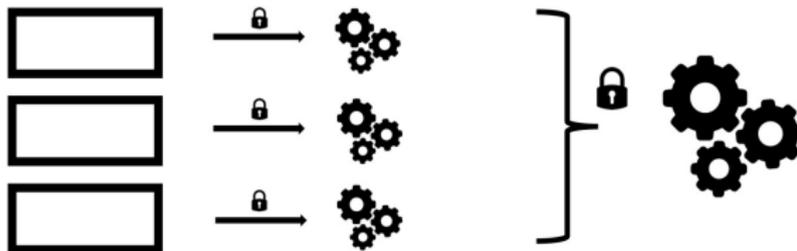
# AI/ML in Cross-Organizational Applications

## 4Paradigm

- data privacy



- cross-organizational: data in different organizations
- federated learning



## Other Example Applications

- product recommendation (content-based / collaborative filtering)
- link prediction
- indoor / outdoor location estimation
- image processing
- document classification
- outlier detection
- compressing deep networks
- ...

# Conclusion

- AI/ML: key to modern industry transformation and innovation
- domain expertise + academia

create new knowledge, generate new solutions, create more value