AI in smart cities

Dhitiwat Prachathomrongpiwat

Cities

- Cities are hubs for economic growth, job creation, new ideas, technological evolution, communication and networking, information and social transformation
- Large percent of the population live in cities.

Smart cities

- A smart sustainable city is an innovative city that use ICTs and other means to improve quality of life, efficiency of urban operations and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, and environmental aspects.

AI

- William Mc Culloch & Walter Pitts developed in 1943.
- *The more you learn about the technology, the more you understand that AI is very powerful. But it needs to be very narrowly defined. If you don't have a narrow scope, it doesn't work. Esposito*

AI

- Use of a computer to model intelligent behavior with minimal human intervention.
- Machines & computer programs are capable of problem solving and learning, like a human brain.
- Natural Language Processing (NLP) and translation,
  - Pattern recognition
  - Visual perception and
  - Decision making
- Machine Learning (ML), one of the most exciting areas for development of computational approaches to automatically make sense of data

Goals

- Improve the quality of life of its citizens
- Ensure tangible economic growth such as higher standards of living and employment opportunities for its citizens
- Improve the well-being of its citizens including medical care, welfare, physical safety and education.
- Establish and environmentally responsible and sustainable which meets the needs of today without sacrificing the needs of future generations.

Goals

- Streamline physical infrastructure based services such as transportation (mobility), utilities (energy, water), telecommunications and manufacturing sectors.
- Reinforce prevention and handling functionality for natural and man-made disasters including the ability to address the impacts of climate change.
- Provide an effective and well balanced regulatory, compliance and governance mechanisms with appropriate and equitable policies and processes in a standardized manner.

Pain Points of any cities

- Infrastructure grows but is not well connected, resulting in traffic jams, missed buses, trains and flights.
- Lack of coordinated response to disaster
- Sources of information are not available
- Shortages of supply occur in electricity, water and food.
- Duplication of resources. Waste occurs.

Government using AI in cities for

- Helping officials learn more about how people use cities.
- Improving infrastructure and optimizing the use of these resources.
- Improving public safety in cities.

Citizen using AI in cities

- Home and office automation.
- Food safety and cost saving.
- Personal lifestyle
  - Entertainment
  - Sex tech. (Lora Dicarlo, IoD: Internet of Dongs)
- CES

Public safety

4 Essential Elements for thriving smart cities

- Pervasive wireless connectivity: LPWAN, LTE Cat M, NB-IoT, LoRa, Bluetooth
- Open data (more and better data)
- Security you can trust in: 4 core security objectives
- Flexible monetization scheme: subscription-based

Key areas

- Transportation
- Health and Education
- Employment and Opportunities
- Sanitation
- Utilities (water, electricity and Gas)
- Safety and Security
- Environment
- ICT infrastructures
- Manufacturing sector
- Real estate & Buildings
- Governance

Role of IoT, AI in smart cities

- The combination of high speed, resilient, low latency connectivity and technologies such as the Internet of Things, Machine Learning in Artificial Intelligence will enable the transformation towards sustainable smart cities.

Top 10 smart cities in the world

Forbes 21 May 2019

- London
- New York
- Amsterdam
- Paris
- Reykjavik
- Tokyo
- Singapore
- Copenhagen
- Berlin
- Vienna

Top 10 smart cities in the U.S.A

Cities in Motion 2019

- New York
- Los Angeles
- Chicago
- San Francisco
- Washington
- Boston
- Miami
- Phoenix
- Dallas
- San Diego

Best smart cities in the U.K.

Computerworld May 2019

- Milton Keynes
- Glasgow
- Nottingham
- Cambridge
- Bristol
- London
- Manchester
- Birmingham
- Leeds

EUROPE

- Paris debuted an electric car sharing program called Autolib in 2011, and has since grown the fleet of vehicles to 3,000.

- London announced

In 2019, it would begin tests on a smart parking project.

Europe

- Copenhagen using sensors to monitor the city's bike traffic in real time, which provides valuable data on improving bike routes in the city. (40% of the city's residents commute by bike each day.)
- Barcelona has adopted smart IoT integrating smart water, lighting and parking management, saved 75 million EUD of city funds and created 47,000 new jobs in the sector.

Europe

- Amsterdam has offering home energy storage units and solar panels for households that are connected to the city's smart grid. These batteries help lower stress on the grid at peak hours by allowing residents to store energy during off-peak hours.

America

- 2014 Galveston using the LPR: License Plate Recognition by gtecha's Pay by plate number parking system. People can pay by phone and LPR technology verifies who is parked legally. Stanford University use VIMOC technologies' LPR system.

America

- 2015 AT&T launched their smart cities framework with Cisco, Deloitte, Ericsson, GE, IBM, Intel and Qualcomm.
- 2018 AT&T make significant deal will provide San Diego with largest smart city IoT sensor platform with 3,200 CityIQ sensor nodes throughout the city. The data can be used to identify parking spots for drivers, help first responders, and identify dangerous intersections.

America

- New York City Drivers spend and average of 107 hours/year looking for parking.

Average Adaptive Signal Control Technology improves travel time by more than 10 %. In areas with particularly outdated signal timing, improvements can be 50% or more.

Gunshot detection technology in Brooklyn and Bronx, which Canden, New Jersey has implemented similar tech.

- Boston and Baltimore have deployed smart trash cans that relay how full they are and determine the most efficient pick up route for sanitation workers.

ASIA

Ministry of Housing and Urban Affairs
Government of India

Smart City

PUBLIC AMENITIES IN CHENNAI

The Smart Cities realize that amenities are precisely what make some places attractive and define the quality of life. Smart Cities are redesigning the streets, offering people the choice to sit where they want.

2 YEARS of fulfilling promises

Ministry of Housing and Urban Affairs
Government of India

Smart City

INTELLIGENT TRANSPORTATION MANAGEMENT IN PUNE

Intelligent Transportation Management will provide technology to help in the gathering of data or intelligence. Components like vehicle locator and passenger information systems deliver benefits through reduced journey times and increased journey time reliability.

2 YEARS of fulfilling promises

ASIA

Ministry of Housing and Urban Affairs
Government of India

Smart City

PUBLIC BICYCLE SHARING IN BHOPAL

Bhopal has developed 10 km long cycle track (5 meter wide), integrating BRTS, public bike sharing and electric vehicles. 39 of the proposed 50 Docking Stations are completed and rest of the stations are at finishing stage. 100 of the proposed 500 Smart Bikes are already procured. The initiative integrates with the fare collection system of the BRTS to aid the multimodal integration.

2 YEARS of fulfilling promises

Thailand: Traffic

ดร ณภัทร จาตุศรีพิทักษ์ ทำ Big Data and AI for Safer Roads ร่วมกับมูลนิธิข้อมูลจราจรอัจฉริยะ เพื่อสร้างข้อมูลกลาง เพื่อลดการสูญเสียบนท้องถนน ในอนาคต

- ไทยมีคนตายกว่า 20,000 คน อยู่อันดับ 2 ของโลก
- การจำกัดความเร็ว แต่กลับมีสถิติการตายค่อนข้างเยอะ
- 7 วันอันตรายช่วงสงกรานต์ เป็น peak ก็จริง แต่คิดเป็น 2-3 % ของทั้งปี
- Peak จริงอยู่ที่เดือนมีนาคม 70-90 % ของอุบัติเหตุในกรุงเทพ เกิดในพื้นที่แค่ 5 % แถว สะพานตากสิน วิภาวดีรังสิต รัชดา และรัชดาจะบ่อยวันศุกร์ และวันเสาร์

Thailand: Traffic

ปัญหา

- ข้อมูลไม่สมบูรณ์ เช่น เกิดที่ไหน รู้แต่สาเหตุการตาย
- การแบ่งปันข้อมูล แต่ละคนทำหน้าที่ต่างกัน ความสนใจข้อมูลต่างกัน
- การทำงานขาดนโยบายที่สนับสนุนตามมา

Thailand: Traffic

- AI ช่วยบอก pattern การเกิดอุบัติเหตุในกรุงเทพได้มากกว่าสัญชาตญาณ
- การ run regression (ต้องรู้สถิติบ้าง) พบว่า พื้นที่ที่มีอุบัติเหตุมาก มักมีป้ายรถเมล์มาก ช่องวิ่งจะเสี่ยงมากกว่าช่องที่หยุด การมีคนขึ้นลงทำให้เกิดอุบัติเหตุ 1 ป้ายรถเมล์ทำให้อุบัติเหตุเพิ่มขึ้น 1 ครั้งต่อปี ชนระหว่างจอด และเคลื่อนตัวออก
- แก้ที่ไฟท้ายของรถ ให้เห็นชัดขึ้นจะดีไหม
- การวิเคราะห์ตัวแปรอื่นต่อไป เช่น ความแออัดในพื้นที่ ความโค้งของถนน การตั้งด่านเป่าแอลกอฮอล์ตอนกลางคืน ฯ

Thailand: PM2.5

PM 2.5 in Bangkok 2019

- Worasom Kundhikanjana, Mar 31,2019

3 Major theories regarding the source of pollution in Bangkok

1. Temperature inversion effect: by government at beginning of 2019 winter season. This blamed emission from old diesel engines for the pollution.
2. Agricultural burning, locally or from surrounding provinces.
3. Pollution from other provinces or countries.

Thailand: PM2.5

- ML to predict the air pollution level in Bangkok using environmental factor such as weather, traffic index and fire maps, date-time features (local hour, weekday versus weekend)
- The source of the pollution is local, then Air Quality Index (AQI) (depend on: wind speed, humidity, average temperature), local traffic, and hour of day.

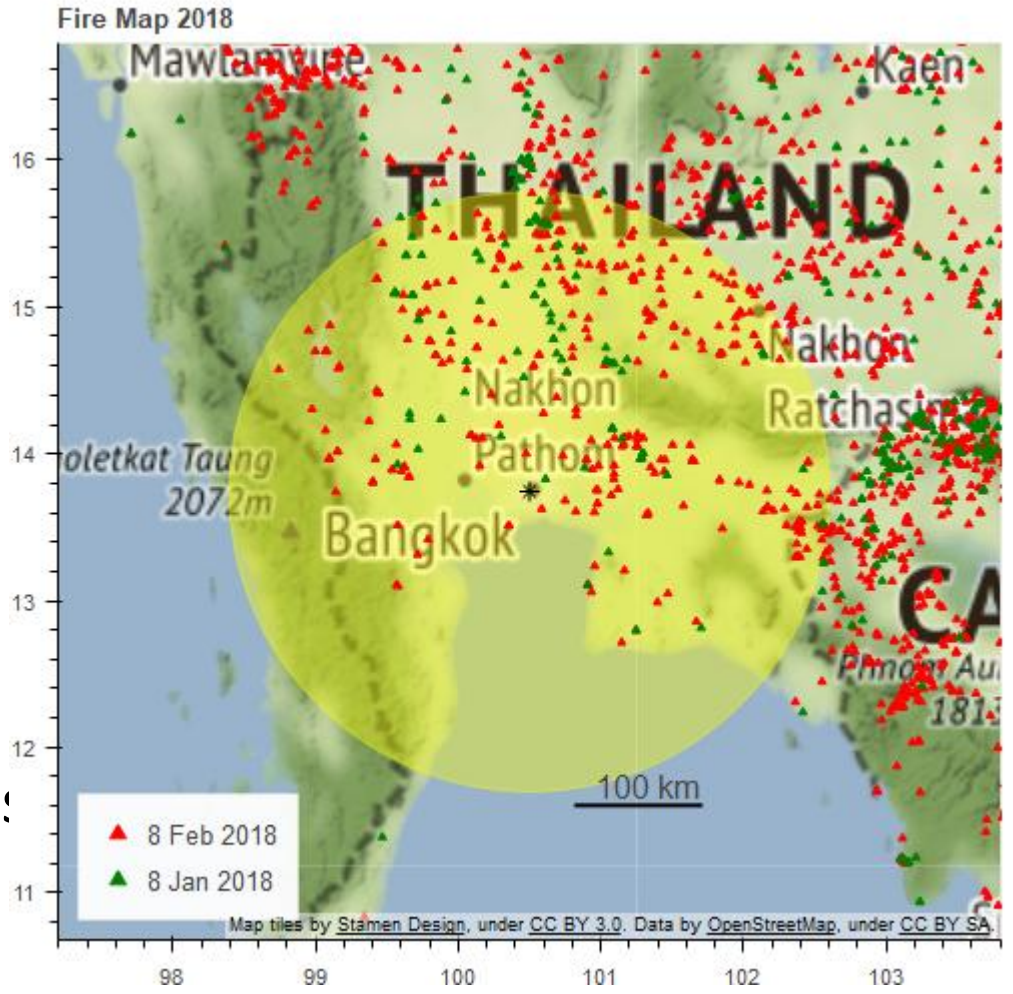
Thailand: PM2.5

Agricultural burning is a major problem.

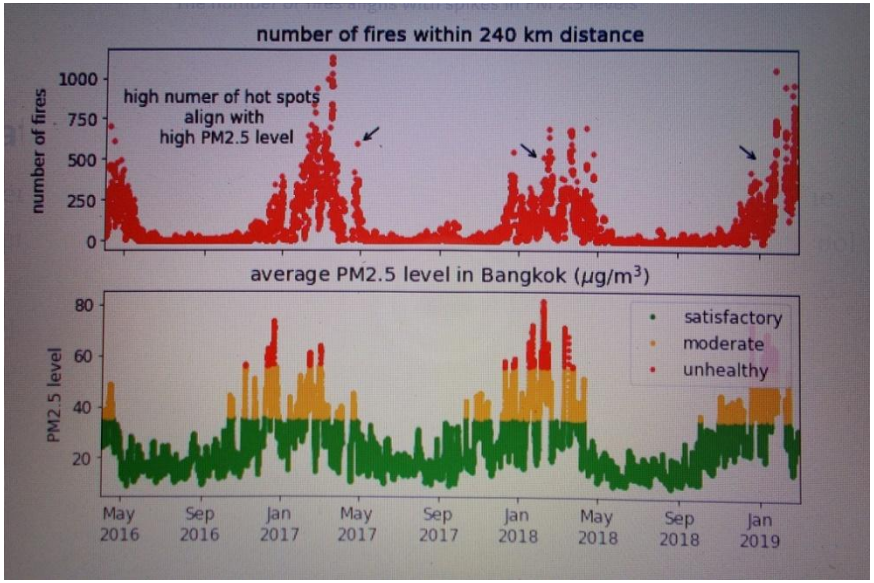
- Jan to Mar is burning

activities to make these provinces among the most polluted places in this time.

PM 2.5 remain in atmosphere for prolonged periods and can travel over very long distances (as far as 240 km away).



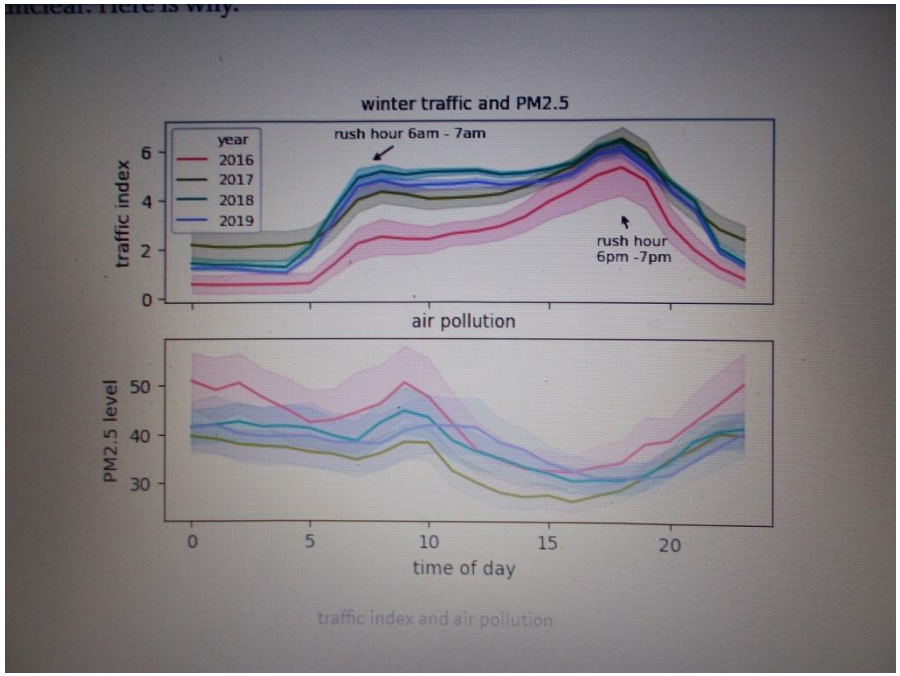
Thailand: PM2.5



Agricultural burning is a major problem.

- Fire pattern closely aligns with the PM 2.5 pattern

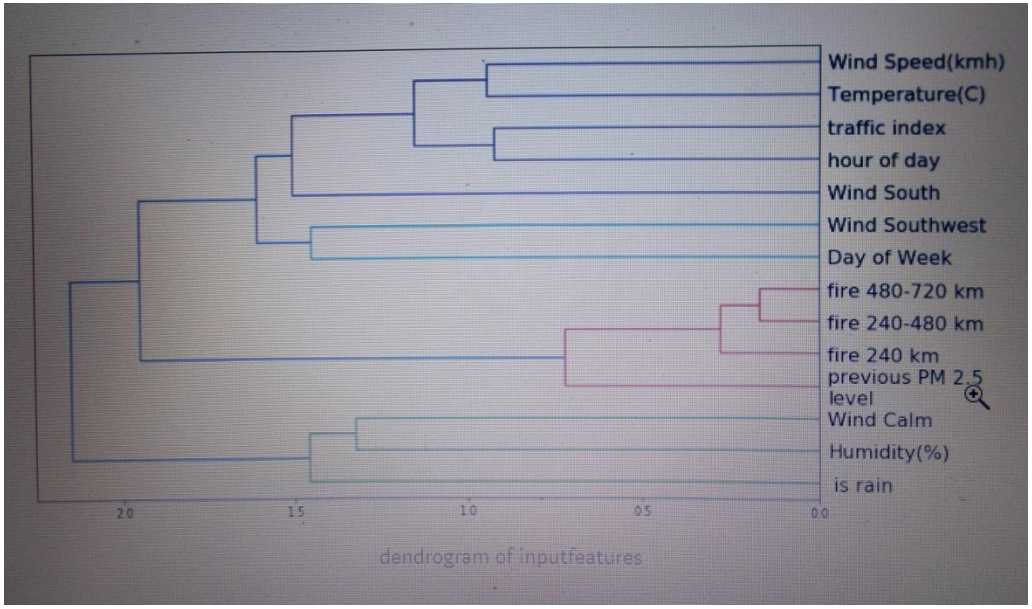
Thailand: PM2.5



Agricultural burning is a major problem.

- The pollution is lower around 3 pm, but remains high during the night time. There does not seem to be a strong correlation.

Thailand: PM2.5



The model achieves 0.99 R-squared on the training set.

The PM2.5 level has a complex relationship with various factors: number of fires, weather patterns, and traffic. But agricultural burning is the root cause in Thailand. Burning activities as fas as 720 km away from Bangkok, and area with extends into Myanmar, Laos, and Cambodia, can cause air problems in Bangkok.

Cyber security

- New technologies bring benefits and challenges
- New technologies are changing the cyber landscape
- Industry must be prepared to take advantage of the opportunities presented by machine learning.
- AI and IoT, it is of vital importance that security by design and privacy by design be considered in the cyber world today.

Cyber security

4 Core security objectives:

- Availability: real-time, reliable access to data to create information and shared with security
- Integrity: reliable and accurate data with accurate and free from manipulation
- Confidentiality: prevent unauthorized disclosure of sensitive information
- Accountability: Their interactions with sensitive systems should be logged and associated with a specific users.

Protect backend systems from intrusion and hacking.

Cyber security

- Artificial intelligence cybersecurity must be both preventative and proactive
- To prevent a global catastrophe, experts from different fields must focus on hacking prevention.

AI and Life Style

Make world progression

- Improve economics
- Improve technologies
- Improve quality of human life
- Make Gap in people
- etc

Make quality of life

- Make peace
- Make self sufficiency
  - Self acceptance
  - Equality in healthcare, education, safety,
- Make global green
- Make everyone easy and lazy
- etc

เธอเคยเสนอ
ลดวันทำงานเป็น
4 วันต่อสัปดาห์
6 ชั่วโมงต่อวัน

Finland
เลื่อนการเข้า-
ออกงานได้วันละ
3 ชั่วโมงในปี
2015

Sweden ลดเวลาทำงานเหลือ 6 ชั่วโมง ตั้งแต่ 2015 นำร่องเมือง Gothenburg

พบว่าดัชนีความสุขของคนเมืองนั้นเพิ่มขึ้นอย่างมาก แต่ภาระงบประมาณที่สูง