Citizens and cities facing new hazards and threats

30th November to 4th December 2020

IT/AI/Cyber

Thomas V. Robertson

Applying Artificial Intelligence to Emergency and Disaster Management

Thomas V. Robertson

TIEMS North America Director
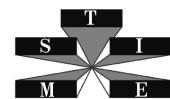
TIEMS 2020 Annual Conference

November 30 – December 4, 2020

Hosted by the TIEMS French Chapter

Presentation Outline

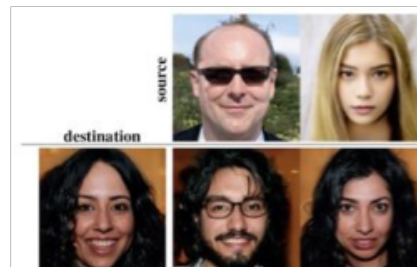- What is Artificial Intelligence (AI)?
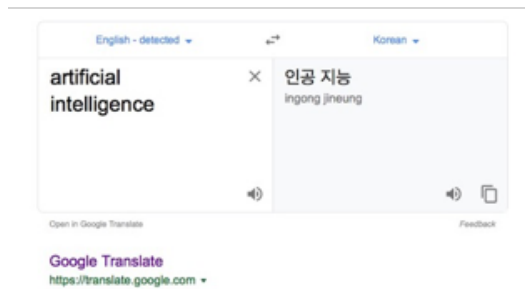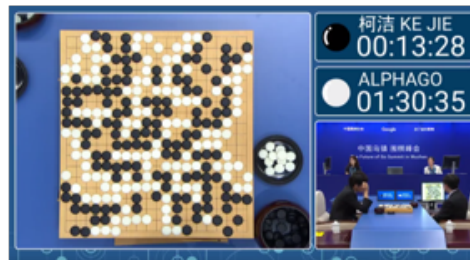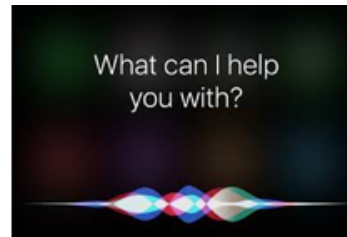- How can AI help Emergency and Disaster Management?

What is Artificial Intelligence?
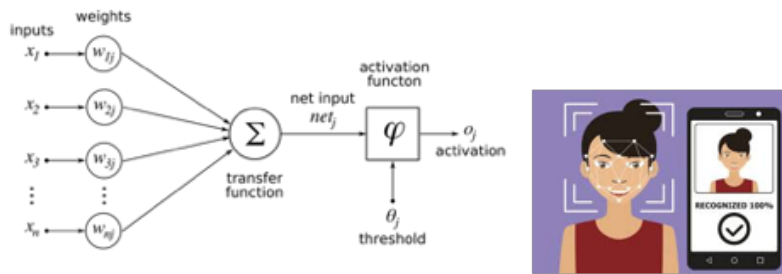
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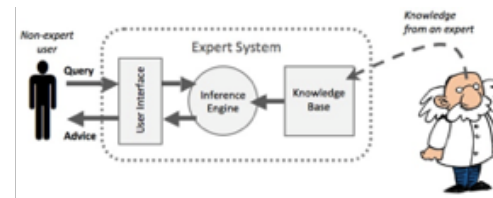
AI Performs Tasks Associated with Human Intelligence

AI uses Multiple Technologies
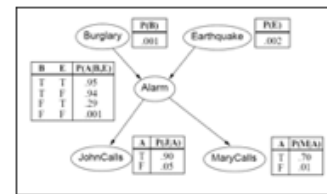

Neural Networks

Expert Systems

Symbolic Logic
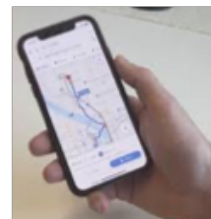
Mathematical Statistics

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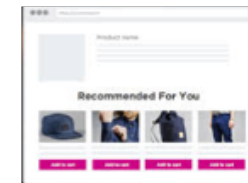
Deep Neural Networks Dominate
AI Advances Today
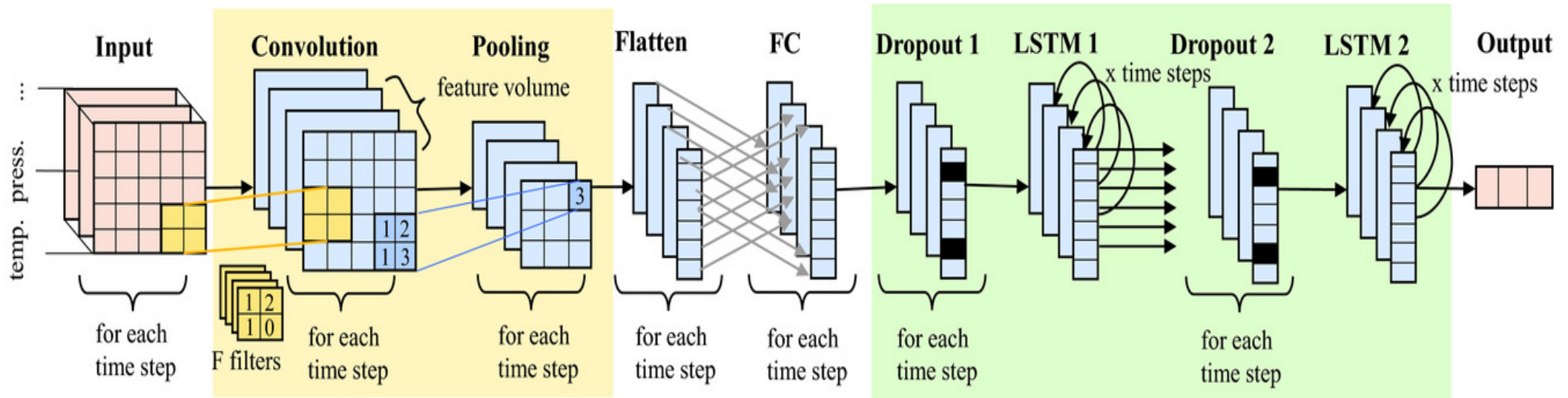
Deep Neural Networks Recognize Patterns by Mapping Input Numbers to Output Numbers
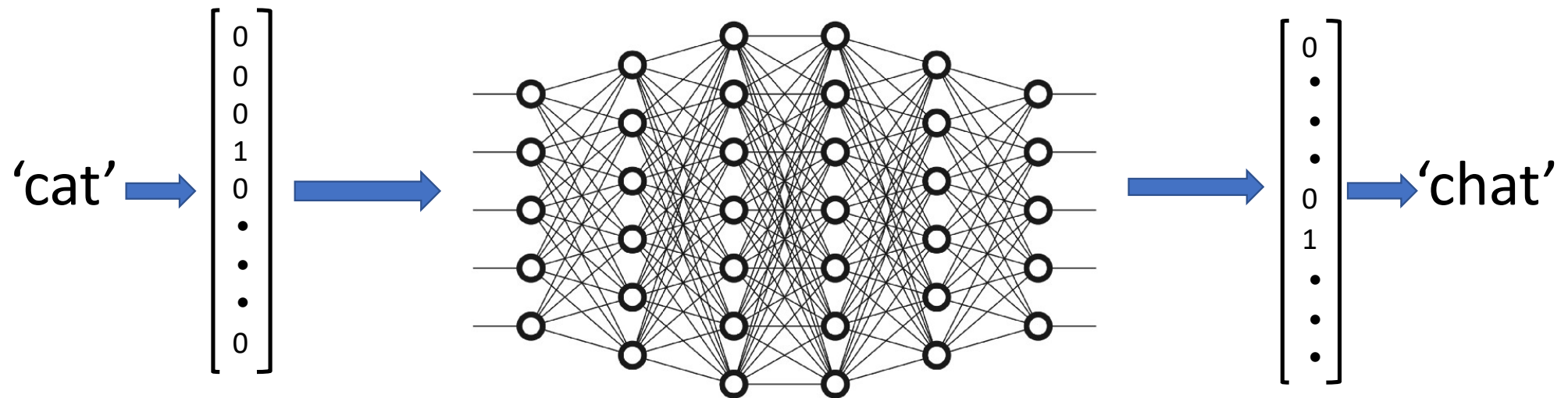
Deep Neural Networks Learn Complex Mappings from Massive Amounts of Training Data

Speech

AI

5 Billion connections

Text

3 million audio samples

220 million text samples using 495,000 word vocabulary

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How can AI help Emergency and Disaster Management?
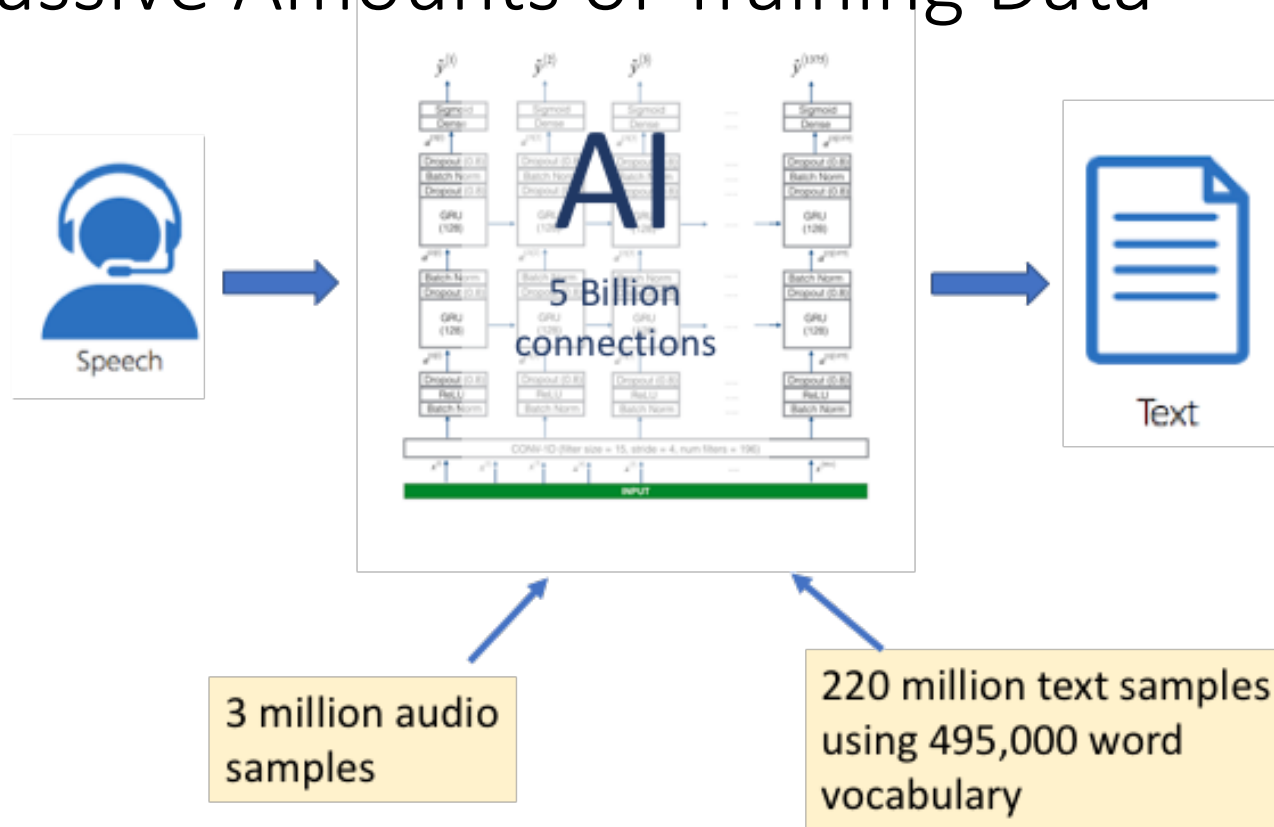
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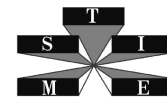
There are Important Patterns in Emergency Management that Can be Recognized in Data

Weather

Flooding

Social Media

Settlement

Damage

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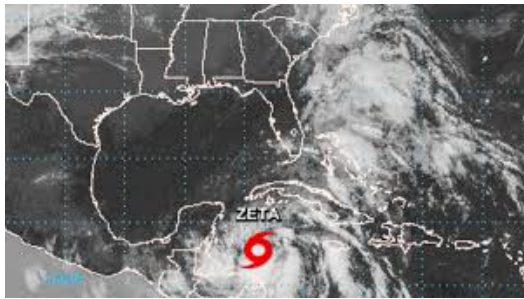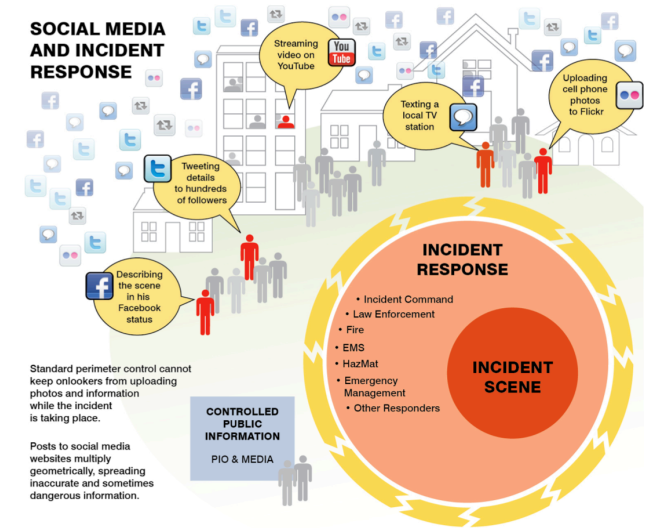
AI and the Four Phases of Emergency and Disaster Management

Urban settlement vulnerability

Flood prediction

Disaster Management Cycle
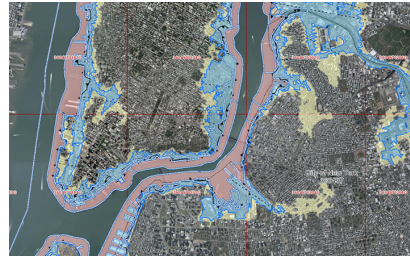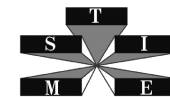
Social media analysis

Damage assessment

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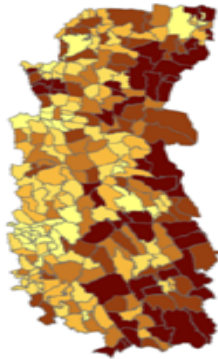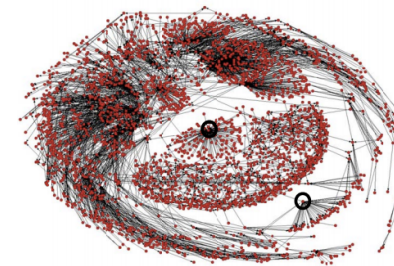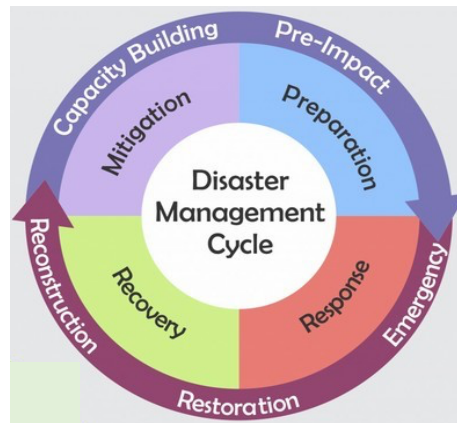
Identifying Vulnerable Settlements*
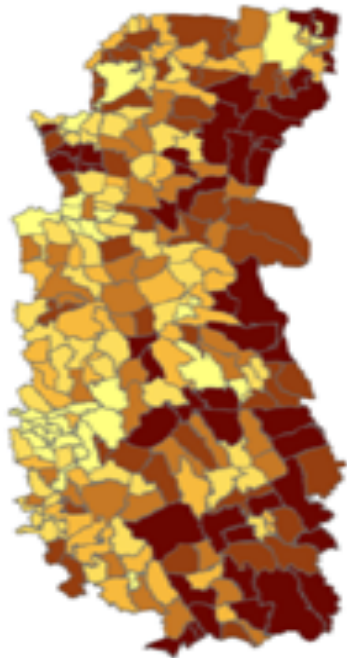
- Poor urban areas are especially vulnerable to disasters
- AI-based technique to identify poor informal settlements from high-resolution satellite imagery
- Good accuracy in Caracas, Kabul, Kandahar, and La Paz

* Oak Ridge National Laboratory

Flood Forecasting and Early Warning*

- Use AI to predict where, when, and severity of floods
- Uses historical events, river level readings, terrain and elevation data

* India Central Water Commission and Google

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Social Media Analysis During Disaster*

- Analyse Twitter tweets during emergencies and disasters
- Tailored to responder needs
- Available as free and open software

* Artificial Intelligence for Digital Response

Automatic Damage Assessment*

- Convolutional neural network to assess damage using high-resolution satellite imagery

- Compares building condition before and after emergency

- Greatly improves recovery timeliness and effectiveness

- 2010 Haiti earthquake required over 90,000 buildings assessed

* United Nations World Food Program Innovation Accelerator

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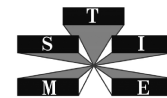
Conclusion

- Recent developments in Artificial Intelligence have opened up new applications of applying large volumes of experiential data to prediction and decision making

- AI can help Emergency Managers recognize patterns relevant to emergency mitigation, preparation, response and recovery