Audio Adversarial Examples

Preliminary Talk

Karla Markert, 07 July 2020

Fraunhofer

AISEC

Outline

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About

About Me

Name	Karla Markert
Department	Cognitive Security Technology
Role	Research assistant
Background	Mathematics, political science and computer science

About

About My Department at AISEC

Cognitive Security Technologies:

Intersection of **artificial intelligence** and **IT security**.

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About

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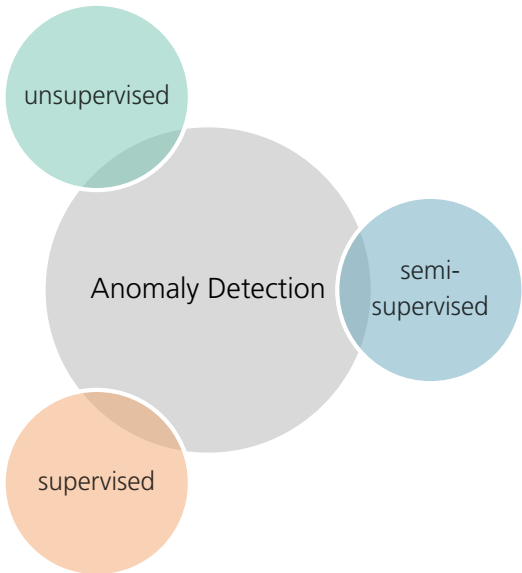

Applications:

- CAN traces,
- malware,
- wireless networks

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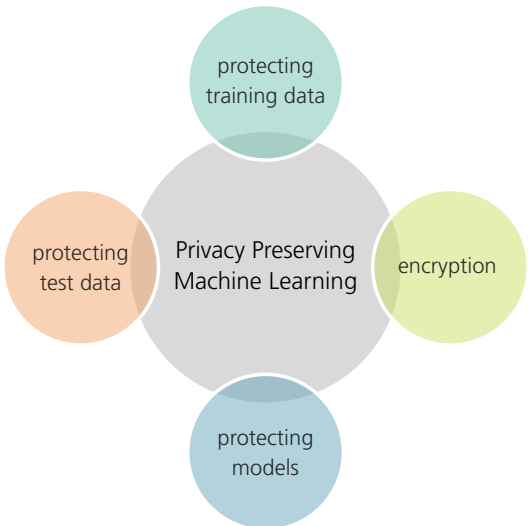

Applications:

- encryption,
- privacy attacks on memory networks,
- architectures for data analysis

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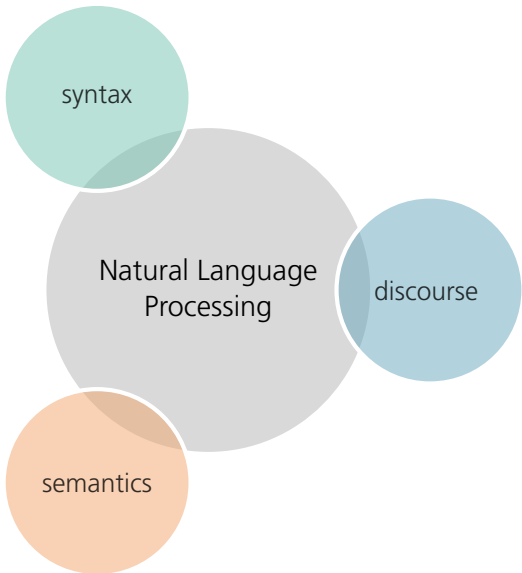

Applications:

- GDPR,
- source code,
- textual descriptions

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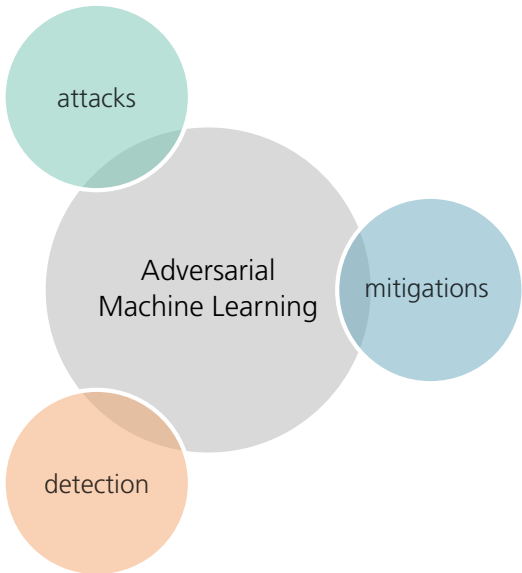

Applications:

- face recognition,
- speech recognition,
- deep fake detection

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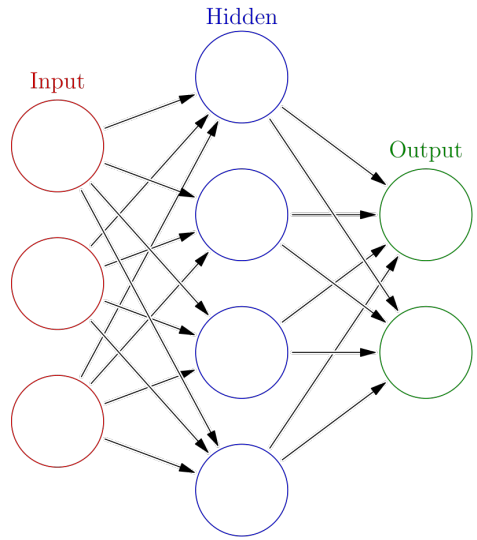
Introduction to Adversarial Examples

Neural Networks

Deep learning "is an approach to AI. Specifically, it is a type of machine learning, a technique that enables computer systems to improve with experience and data. [...] Deep learning is a particular kind of machine learning that achieves great power and flexibility by representing the world as a nested hierarchy of concepts, with each concept defined in relation to simpler concepts, and more abstract representations computed in terms of less abstract ones." [2]

Introduction to Adversarial Examples

Neural Networks



Visualization of a neural network with one hidden layer.

Image taken from Wikipedia[1].

[1] See `https://en.wikipedia.org/wiki/Artificial_neural_network`, last checked January 4, 2020.

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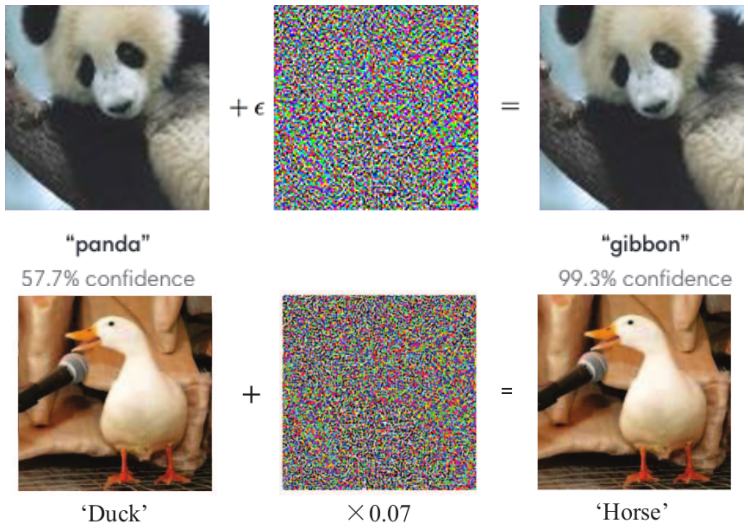
Introduction to Adversarial Examples

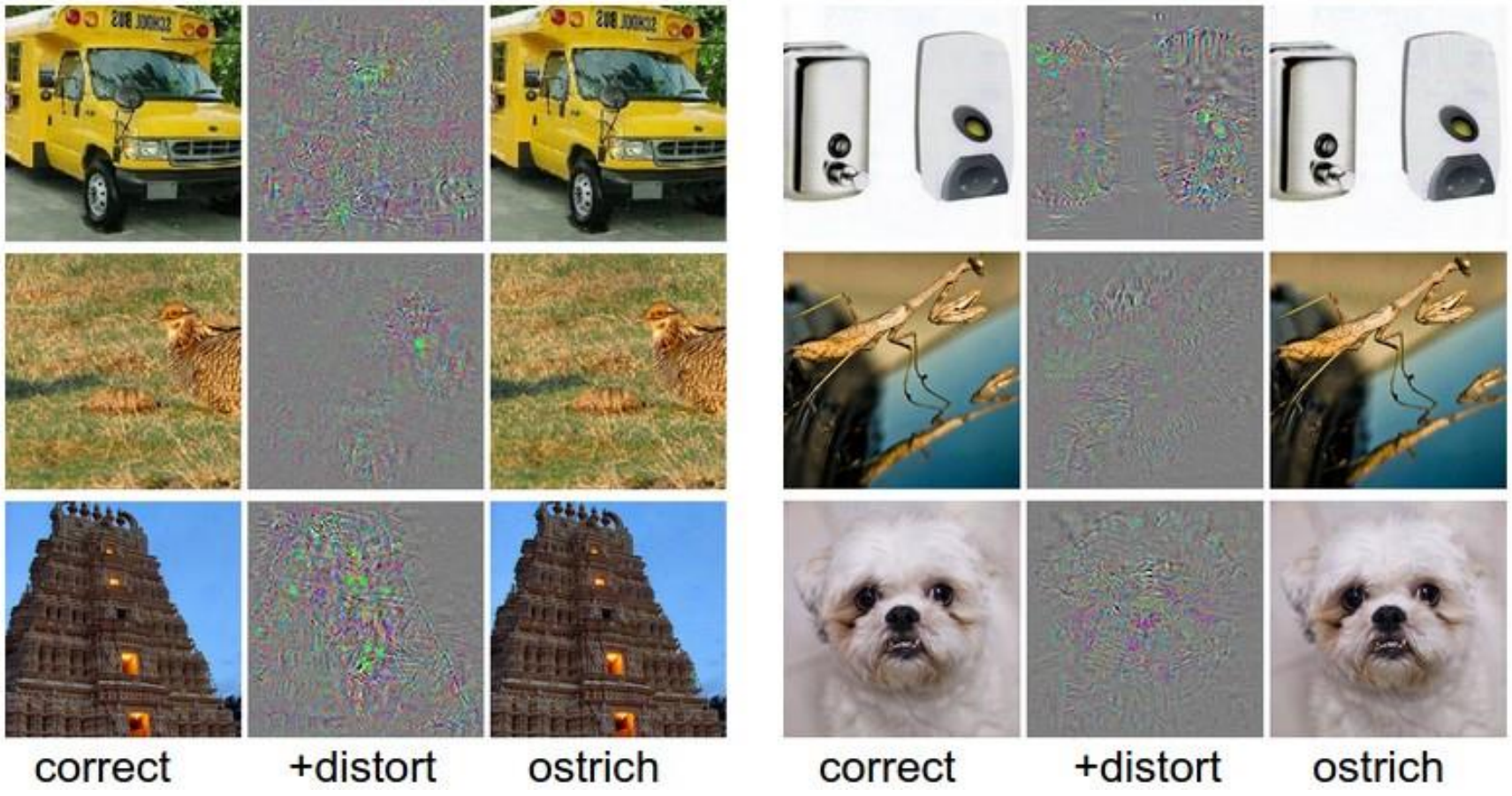
Adversarial Images



Images taken from [5, 4].

Introduction to Adversarial Examples

Adversarial Images



Images taken from [7]. *Ostrich* means *Strauß* in German.

Introduction to Adversarial Examples

Adversarial Images

Stop sign recognized as stop sign.

Stop sign recognized as bottles.

Images taken from [6].

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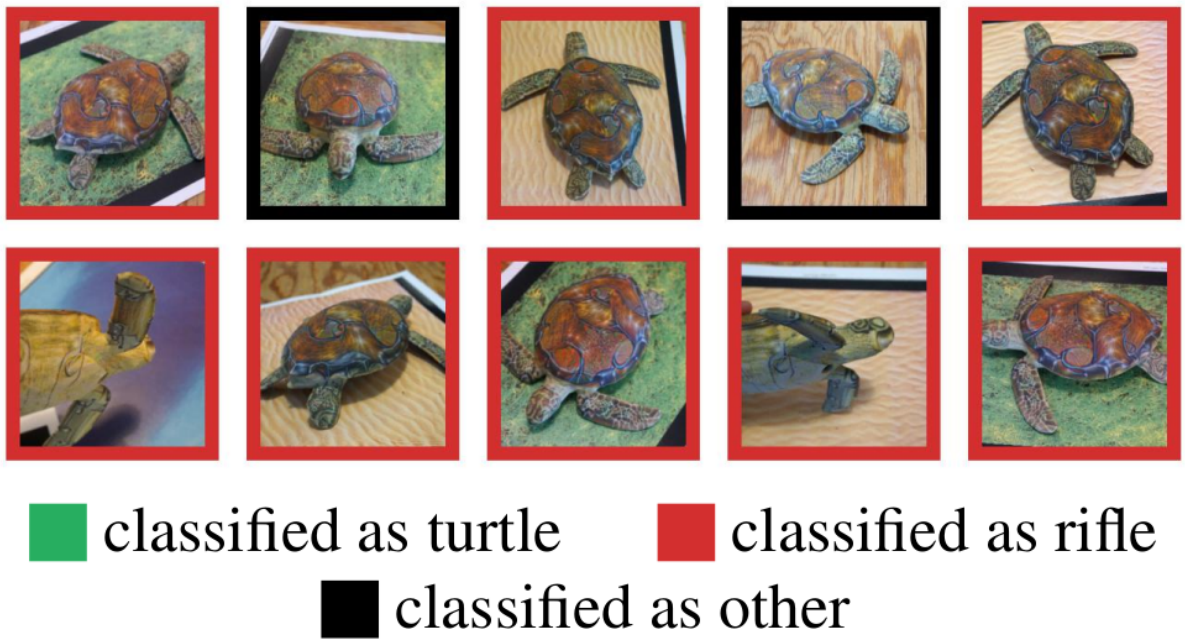
Introduction to Adversarial Examples

Adversarial Images



Images taken from [1].

Introduction to Adversarial Examples

Adversarial Audio

Original

Transcription: without the dataset the article is useless

Adversarial

Transcription: okay google browse to evil dot com

Examples taken from [3].

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Organizational Stuff

In this seminar, we take a look at different audio adversarial attacks and possible mitigations.

- **Level:** Bachelor and Master
- **Number of Participants:** 8
- **Language:** English
- **Requirements:** Basic knowledge in machine learning (especially deep neural networks) and IT security.

Organizational Stuff

Time: This course will be held as a block seminar.

- **July 10** (Friday), 14:00 - 14:45 *Preliminary talk*
- **August 11** (Tuesday) 14:00-15:00 *Kick Off*
- **November 26** (Thursday) and **November 27** (Friday), 9:00-17:00 *Presentations*
- **December 4** (Friday), 9:00-10:00 and **January 15** (Friday), 9:00-10:00 *Debriefing*
- **December 7** (Monday), 23:59 *Deadline for paper*

Organizational Stuff

Goals:

- familiarization with scientific paper reading and scientific presentations;
- better understanding of attacks against machine learning algorithms;
- active participation and insights into topics of current research. For more information, see module description IN0014 and IN2107.

Organizational Stuff

Method: The seminar is organized as follows.

- Every participant gives a *presentation on a scientific paper*, which is assigned in the kick off session.
- Every student is required to write a *four page hand out* summarizing the main points of the paper (LaTeX template will be provided).

We attach great importance to all students profiting from the others' presentations.

Organizational Stuff

The **grade** is composed up of:

- 10% active participation,
- 25% presentation (structure of the talk, introduction to the topic, clear problem definition and motivation, sound style of delivery...),
- 25% hand out (language, structure of the hand out...),
- 40% quality of the content (main points of the paper, good discussion and outlook...)

Organizational Stuff

Everyone interested in participating is required to send an e-mail to karla.markert@aisec.fraunhofer.de until July 16 indicating her/his interest. You may include a letter of motivation, a CV or a transcript of records.

...any questions so far?

Bibliography

[1] Anish Athalye et al. "Synthesizing robust adversarial examples". In: *arXiv preprint arXiv:1707.07397* (2017).

[2] Christopher M Bishop. *Pattern recognition and machine learning*. Springer, 2006.

[3] Nicholas Carlini and David A. Wagner. "Audio Adversarial Examples: Targeted Attacks on Speech-to-Text". In: *CoRR* abs/1801.01944 (2018). arXiv: 1801.01944. URL: http://arxiv.org/abs/1801.01944.

[4] Yuan Gong and Christian Poellabauer. "Protecting voice controlled systems using sound source identification based on acoustic cues". In: *2018 27th International Conference on Computer Communication and Networks (ICCCN)*. IEEE. 2018, pp. 1–9.

[5] Ian J Goodfellow, Jonathon Shlens, and Christian Szegedy. "Explaining and harnessing adversarial examples". In: *arXiv preprint arXiv:1412.6572* (2014).

[6] Jiajun Lu, Hussein Sibai, and Evan Fabry. "Adversarial Examples that Fool Detectors". In: *CoRR* abs/1712.02494 (2017). arXiv: 1712.02494. URL: http://arxiv.org/abs/1712.02494.

[7] Christian Szegedy et al. "Intriguing properties of neural networks". In: *arXiv preprint arXiv:1312.6199* (2013).

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