Introduction to Trustworthy Machine Learning

Franziska Boenisch and Adam Dziedzic

Course on Trustworthy Machine Learning

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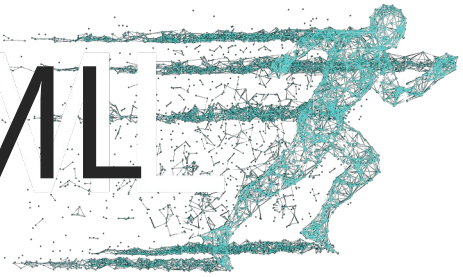
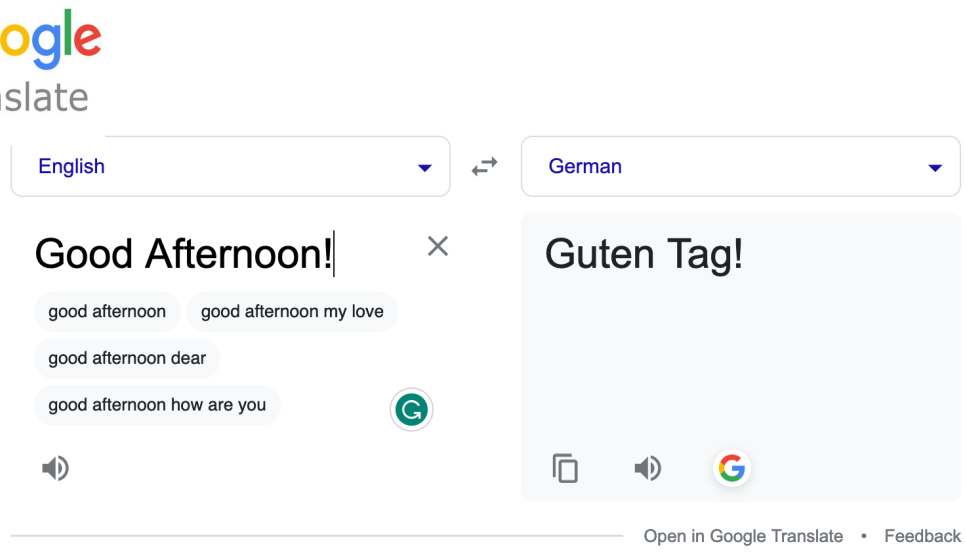
CISPA

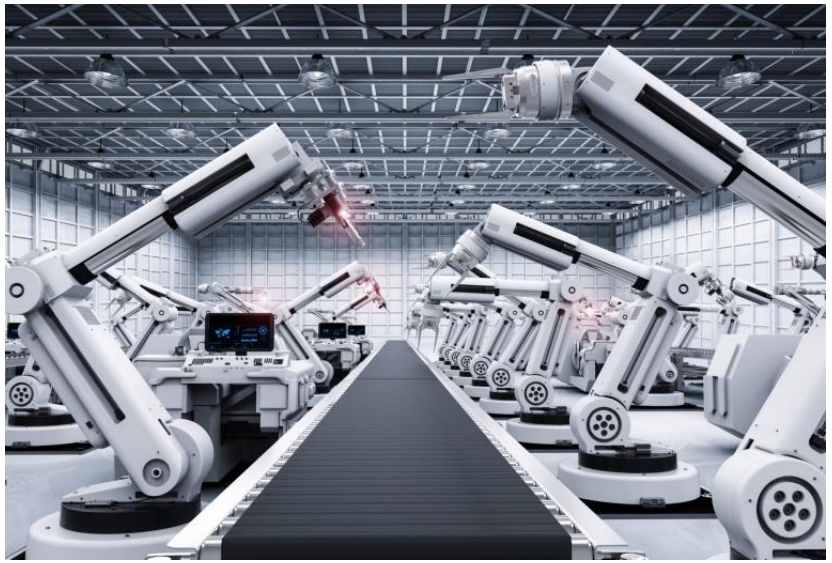
HELMHOLTZ CENTER FOR INFORMATION SECURITY

SprintML



Machine Learning Fuels Many Applications





A Glitch in Google's Translation Service

Google Translate

The service outputs its memorized content.

From the Bible
(1 Kings 7:2)

Source: https://www.vice.com/en/article/j5npeg/why-is-google-translate-spitting-out-sinister-religious-prophecies

Catastrophic Failures of Self-Driving Cars

BBC

> Tesla cars in fatal crashes were on Autopilot.

Source: https://www.bbc.com/news/world-us-canada-43604440

ML Deployed in Adversarial Setting

The New York Times

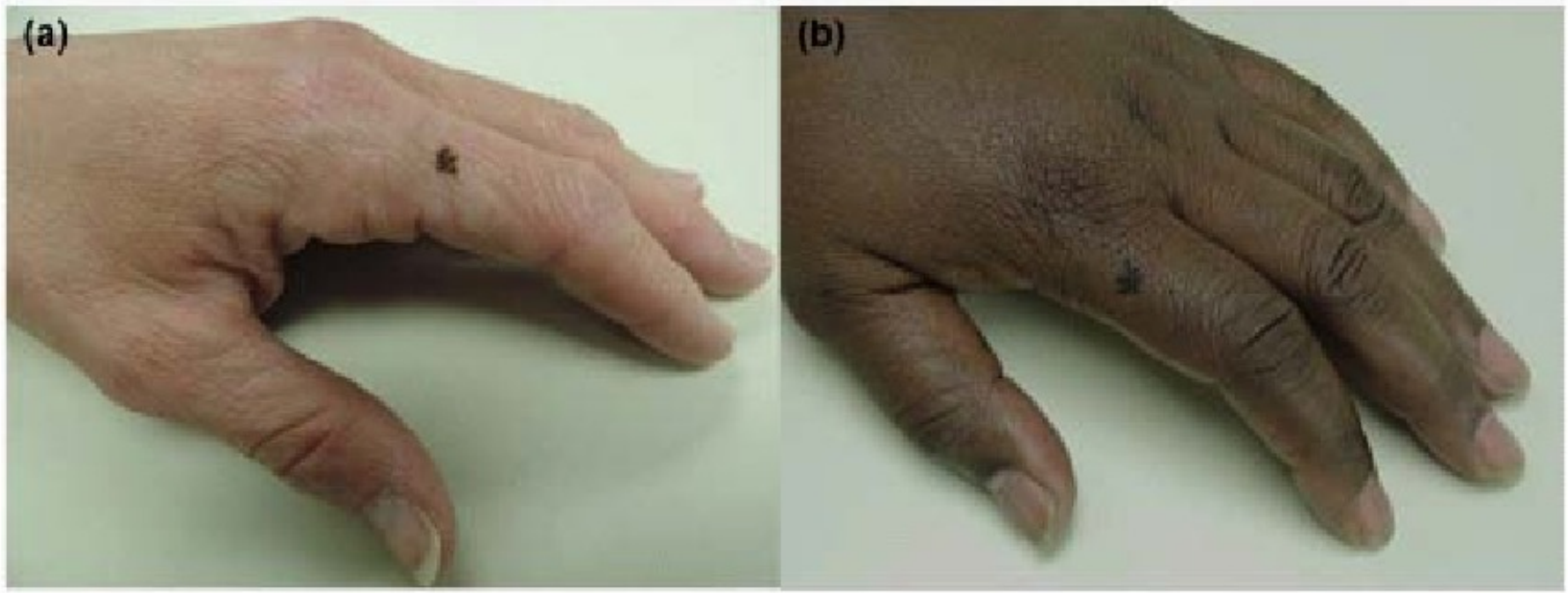
> Microsoft created a Twitter bot to learn from users. It quickly (<16 hours) became a racist jerk.

Sources: https://en.wikipedia.org/wiki/Tay_(chatbot)#cite_note-bbc_swear-1
https://www.nytimes.com/2016/03/25/technology/microsoft-created-a-twitter-bot-to-learn-from-users-it-quickly-became-a-racist-jerk.html

Bias in Machine Learning Models

The Guardian

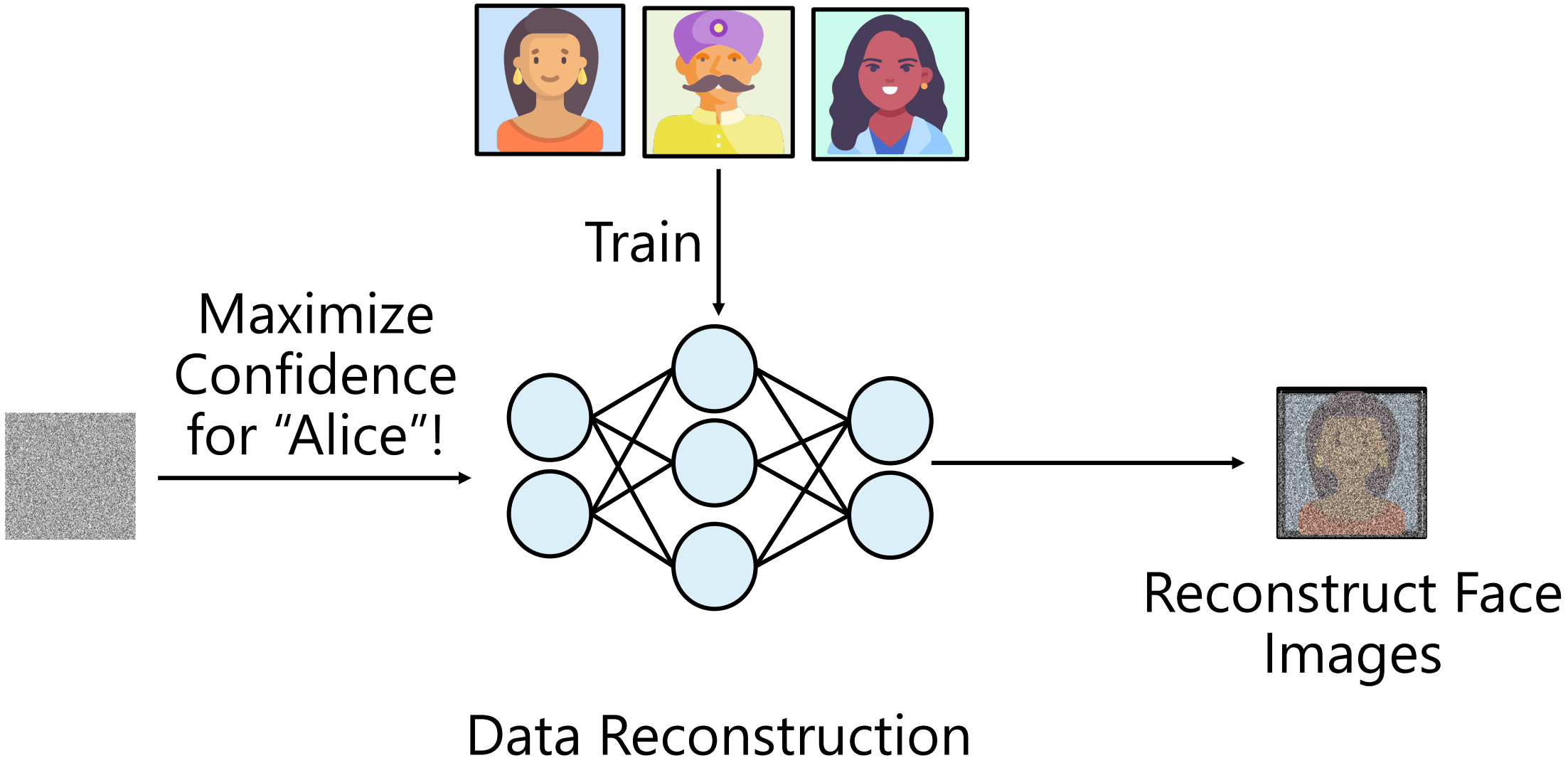
AI skin cancer diagnoses risk being less accurate for dark skin – study.



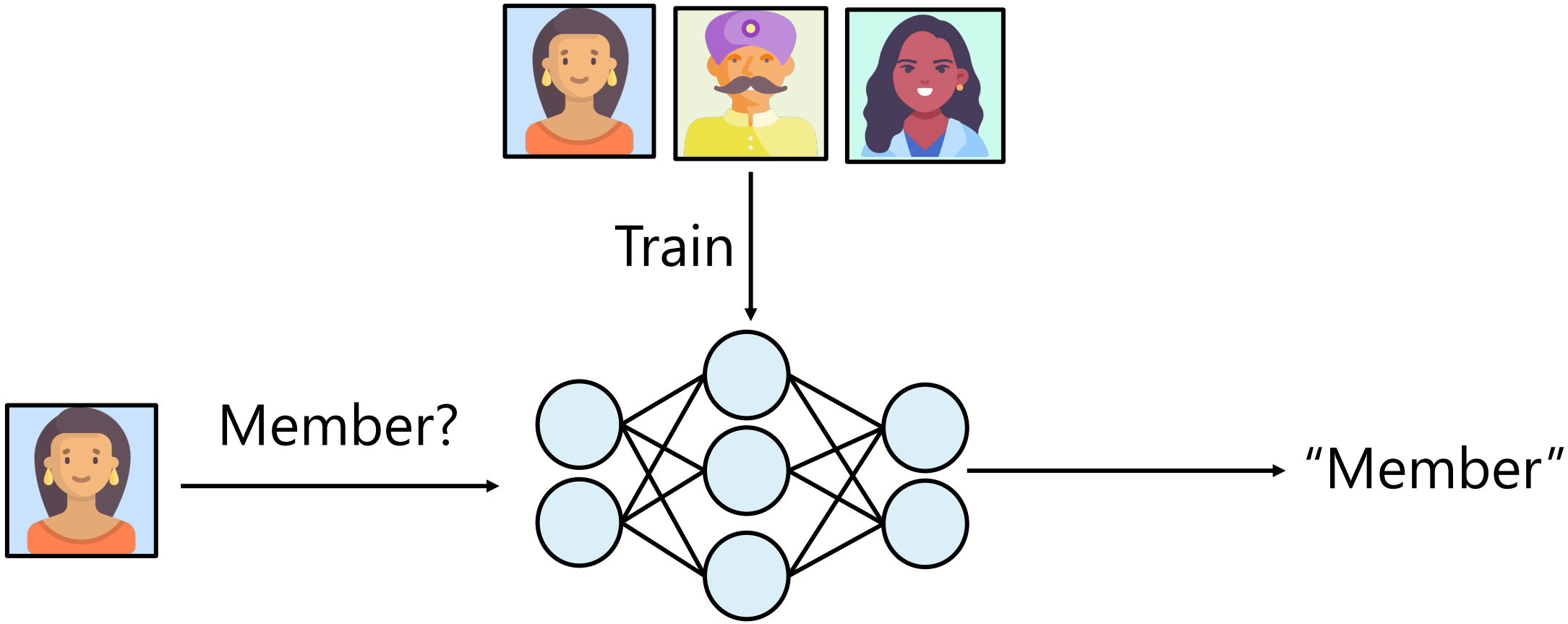
Sources: https://www.theguardian.com/society/2021/nov/09/ai-skin-cancer-diagnoses-risk-being-less-accurate-for-dark-skin-study

What are the risks to Trustworthy ML?

Privacy for Machine Learning

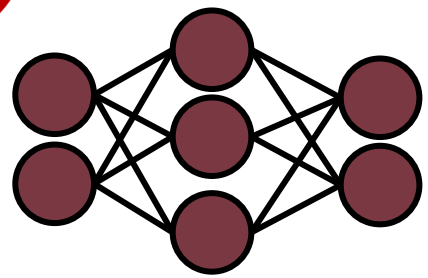


Privacy for Machine Learning



Membership Inference

Model Stealing

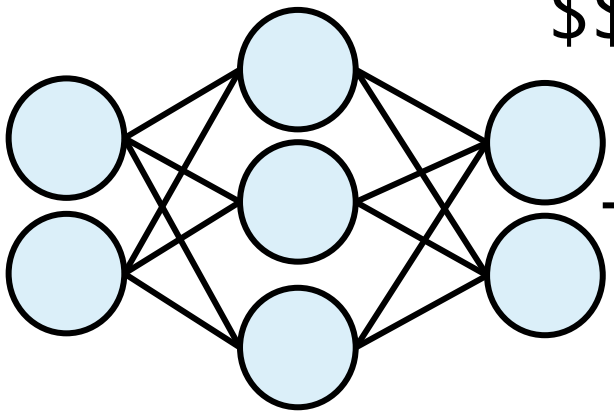


Train

Train Stolen Copy

$$$

Label!



"No Entry"

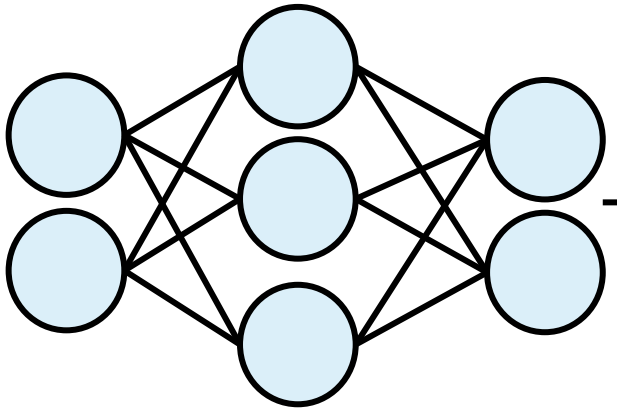
Model Stealing

Robustness of Machine Learning

Add Human-Imperceptible Noise!

Train

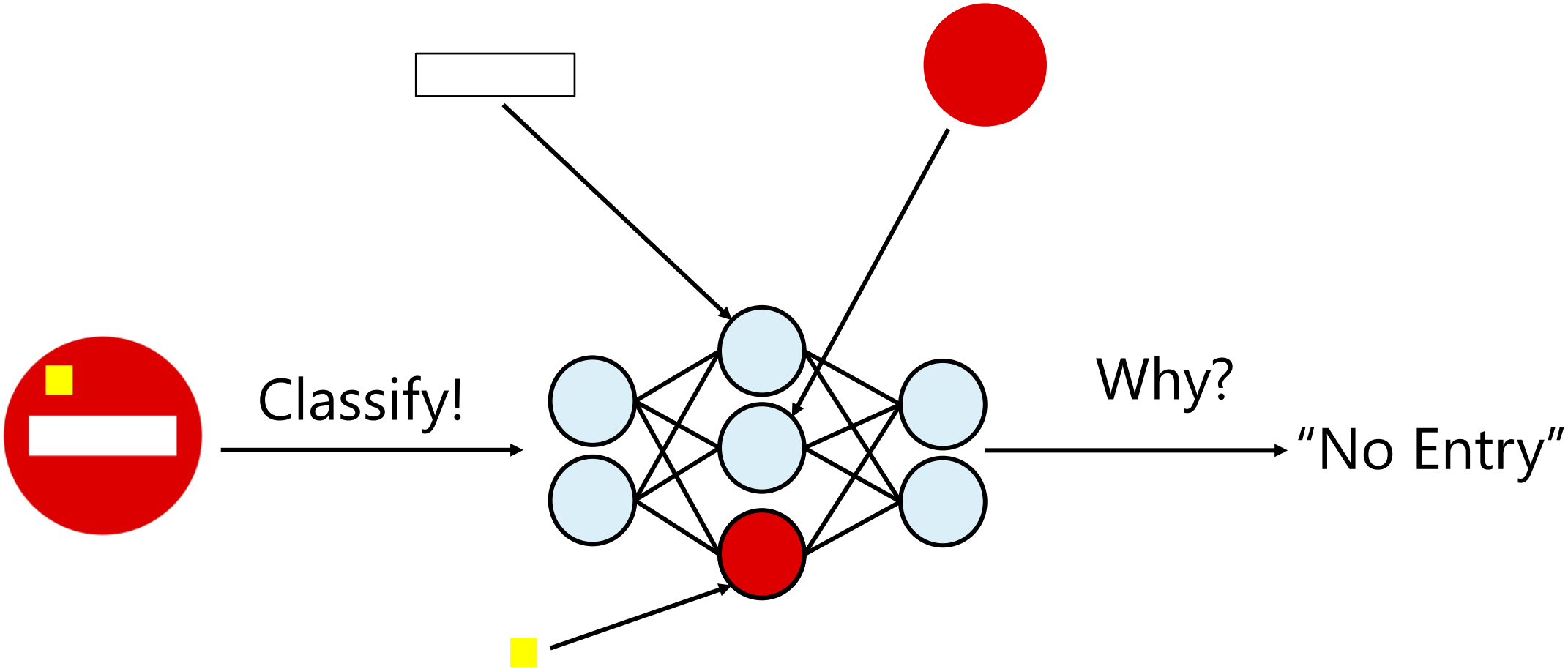
Classify!



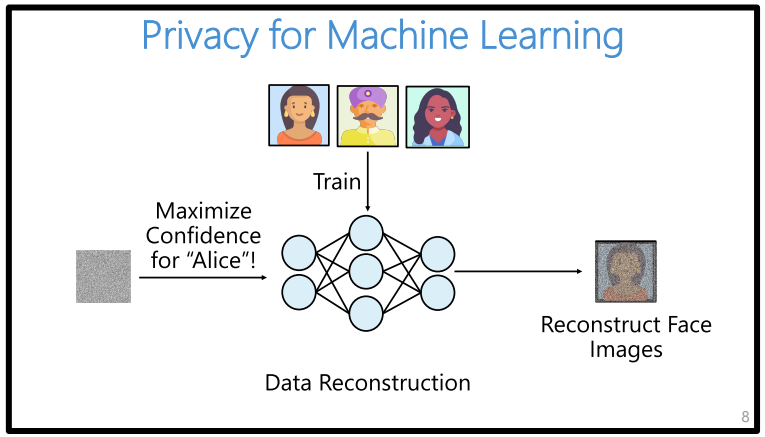
"Right of Way"

Adversarial Examples

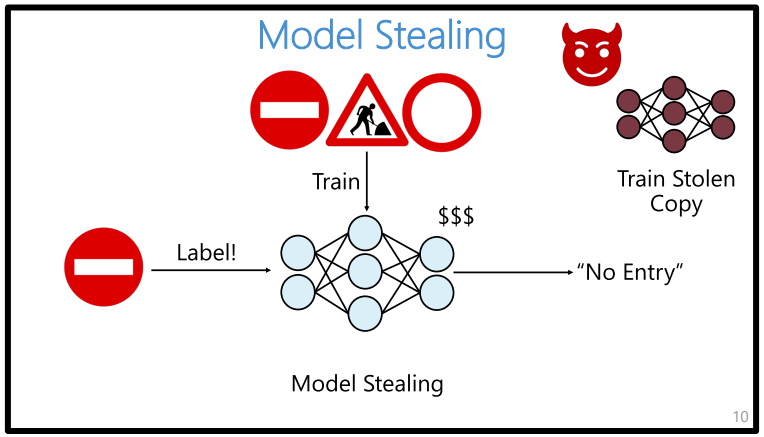
Interpretability of ML Predictions



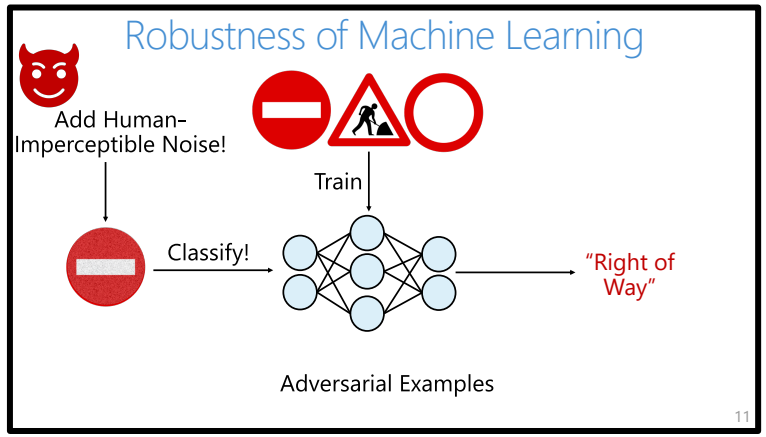
Many Facets of Trustworthy Machine Learning



Privacy



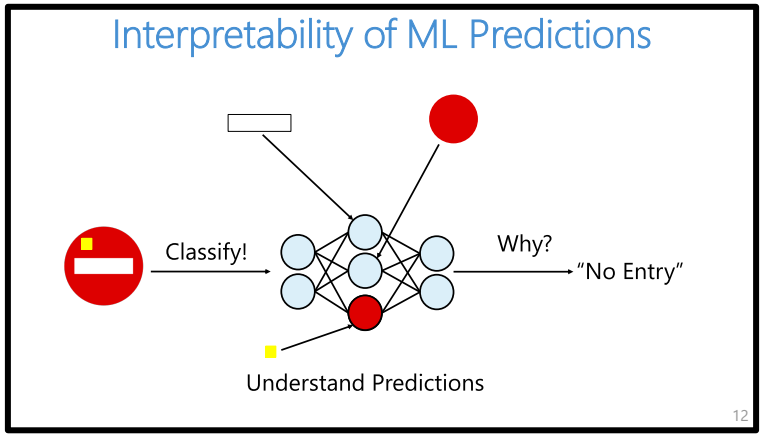
Model Stealing



Robustness

Collaboration

Fairness



Explainability

Security

Governance

Thank you!

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