CSE 484 / CSE M 584: Computer Security and Privacy

Emerging Tech + Wrap-Up

Spring 2019

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Thanks to Dan Boneh, Dieter Gollmann, Dan Halperin, Yoshi Kohno, John Manferdelli, John Mitchell, Vitaly Shmatikov, Bennet Yee, and many others for sample slides and materials ...

Admin

- **Extra credit reading due** tomorrow @ 11:59pm
  - No late days for extra credit readings
- **Lab 3 due** Friday @ 5pm
- **Final project due** Wed, June 12 @5pm
  - No late days
  - Make sure you address legal/ethical issues
  - Make sure you include references
    - At the end is OK, but embedded where relevant is usually better
- No section tomorrow, no class Friday

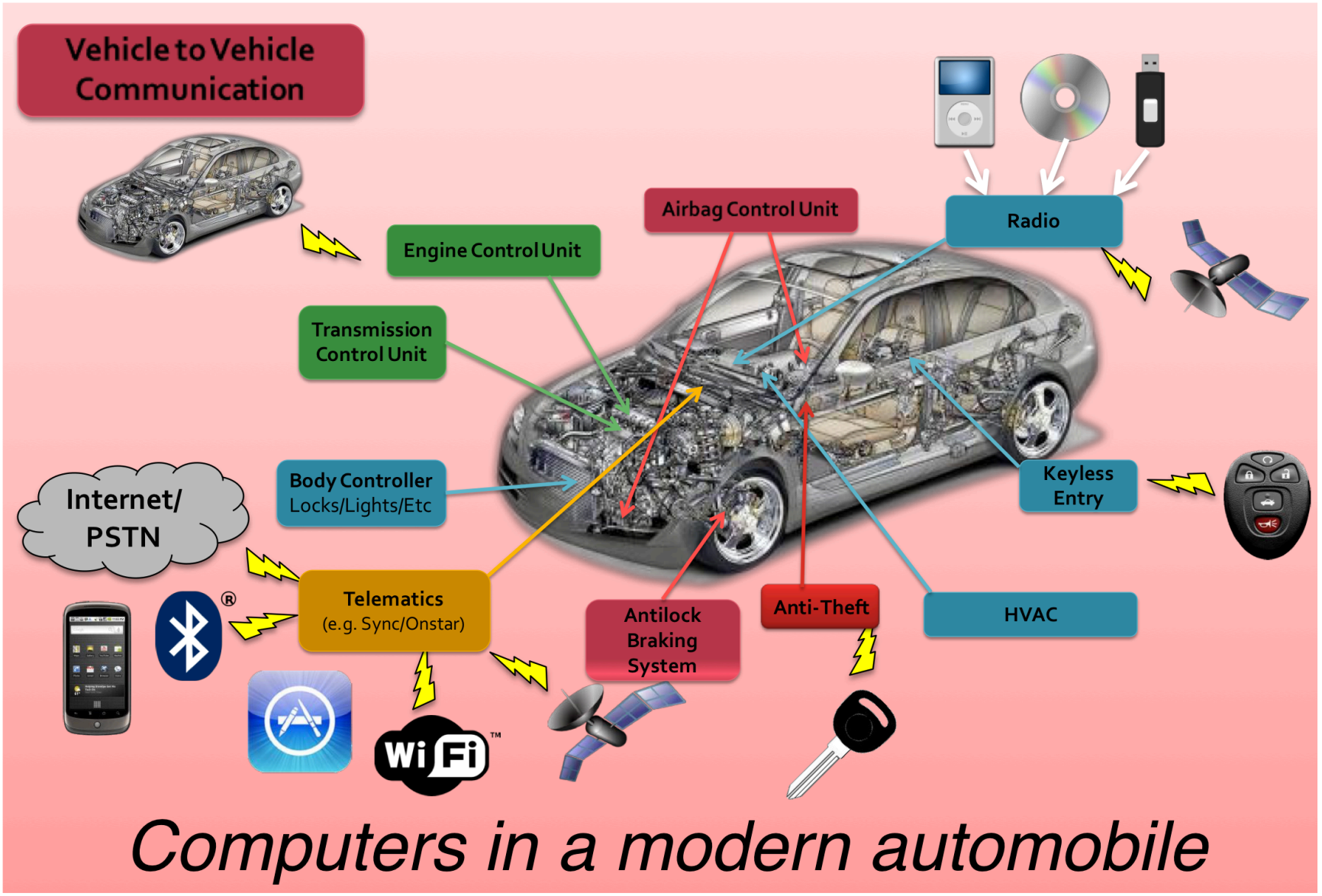
SECURITY AND PRIVACY FOR EMERGING TECHNOLOGIES

(1) Connected Automobiles

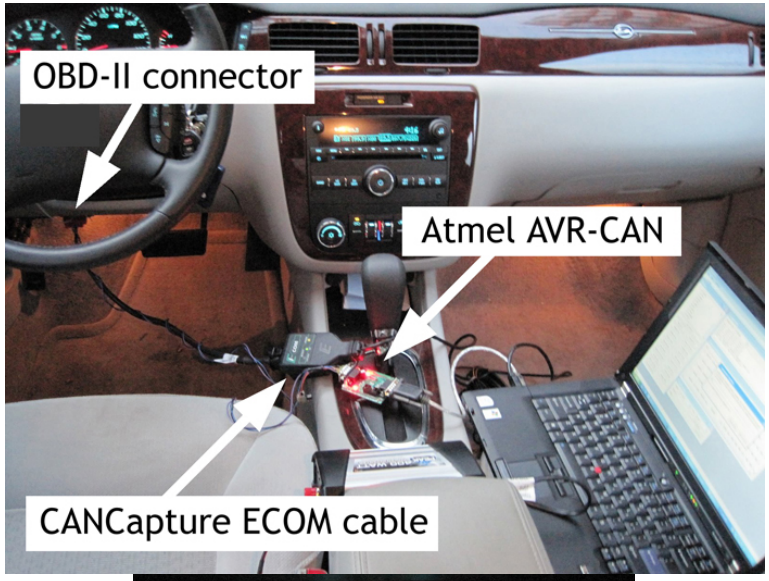
- Already emerged by now, but a fun story ☺

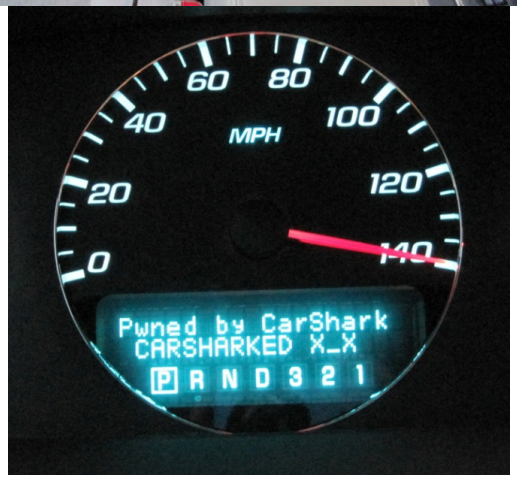
- Automobiles were only just being connected to the internet when we (UW+UCSD) studied them (~2009)
  - Had not faced significant adversarial pressure

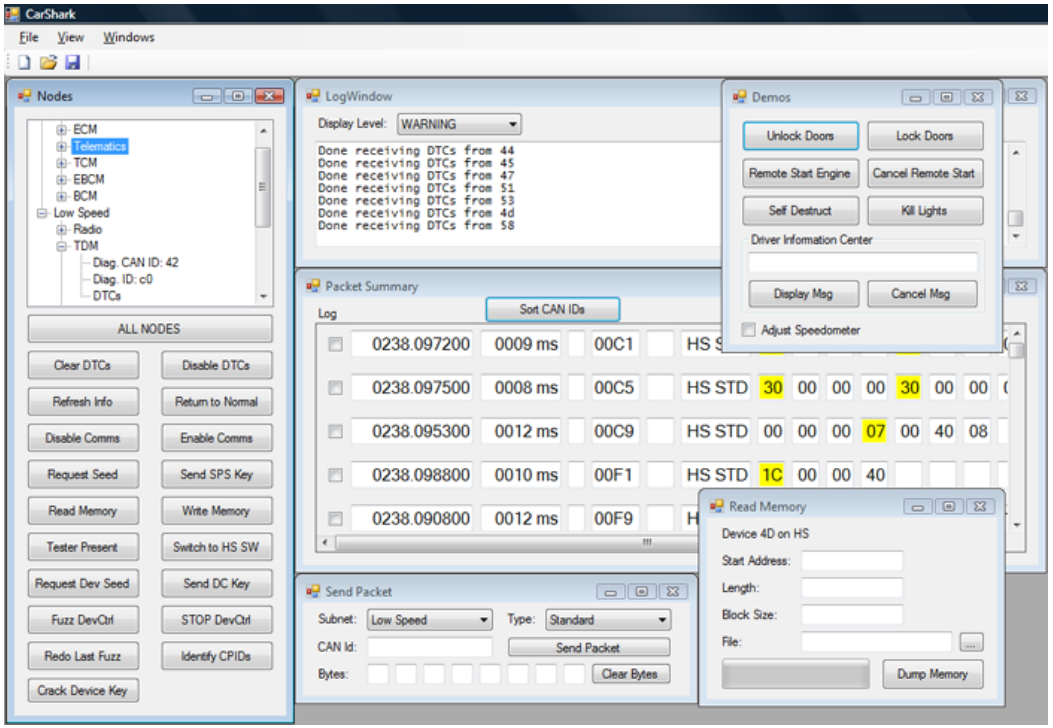
www.autosec.org


Vehicle to Vehicle Communication
Airbag Control Unit
Radio
Engine Control Unit
Transmission Control Unit
Body Controller
Locks/Lights/Etc
Keyless Entry
Internet/
PSTN
Telematics
(e.g. Sync/Onstar)
Antilock Braking System
Anti-Theft
HVAC
Wi Fi
Computers in a modern automobile

Experiments with a Real Car







Experiments with a Real Car

Example: Force Brakes On/Off

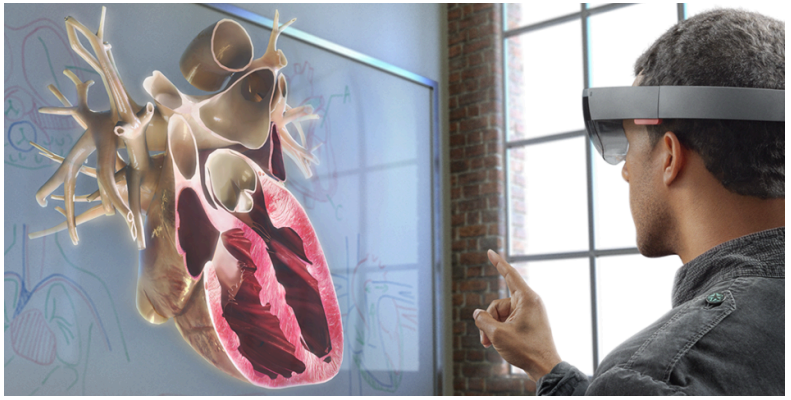
https://www.youtube.com/watch?v=H6oozuid1K4

https://www.youtube.com/watch?v=917VOx6tBKA

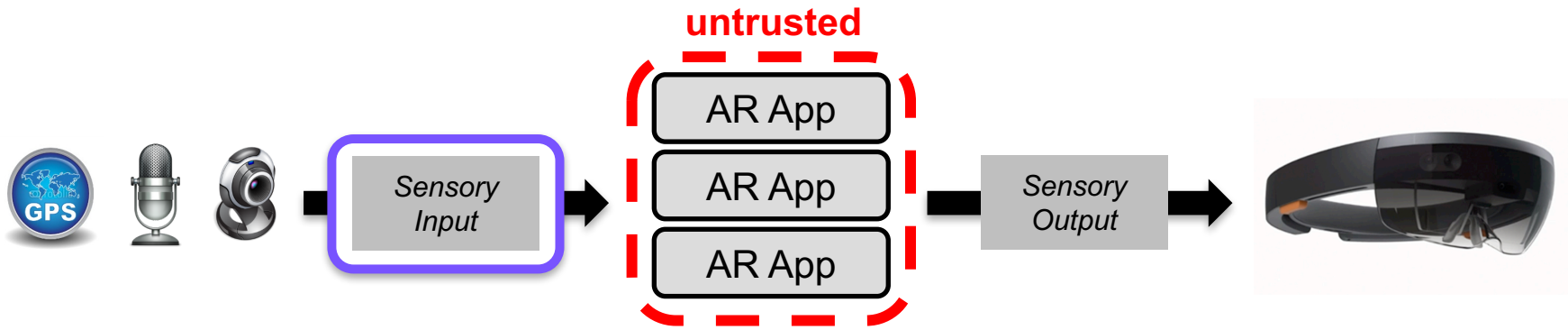
Impacts

- Impact on automotive industry
  - Significant investment by automotive companies
  - Spurred vendor industry around automotive security
- Impact on standards, regulation, and legislation
  - SAE International (de facto standards body for the U.S. automotive industry) created committee and standards
  - Resources committed by NHTSA
  - U.S. bills on automotive cybersecurity
- Impact on research
  - New subfield of automotive security and significant DARPA and other funding efforts

(2) Security and Privacy for Augmented Reality



AR Input Privacy

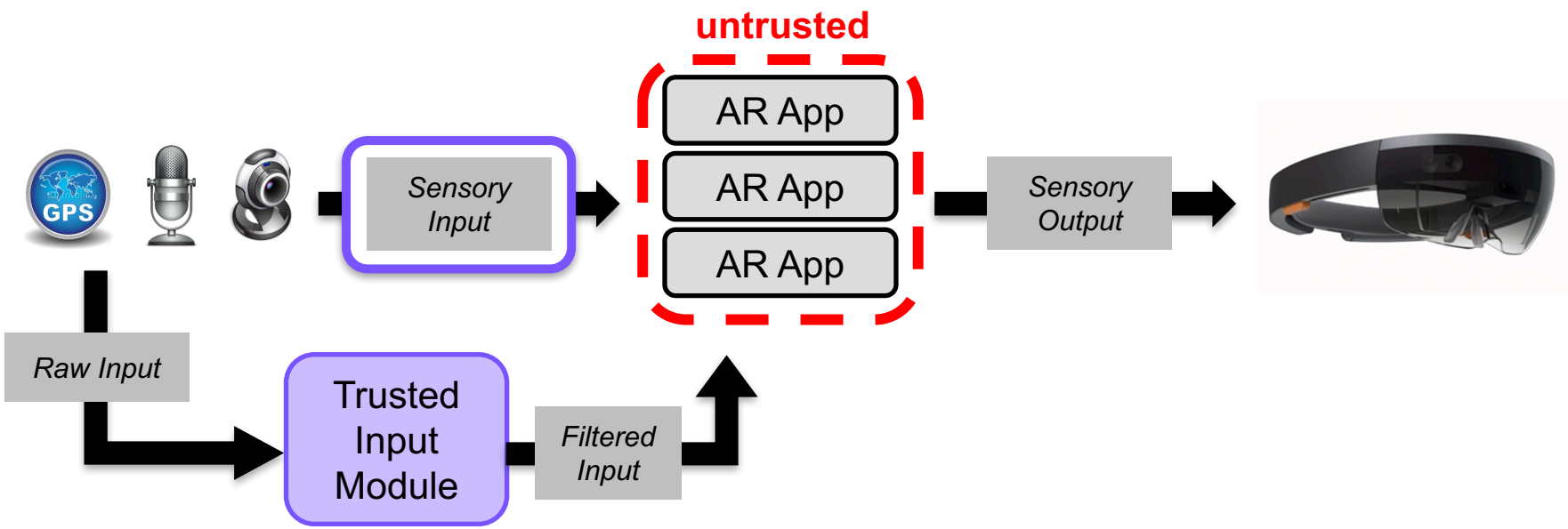


Seattle dive bar becomes first to ban Google Glasses over privacy fears

By NINA GOLGOWSKI

PUBLISHED: 00:43 EST, 10 March 2013 | **UPDATED:** 02:16 EST, 10 March 2013

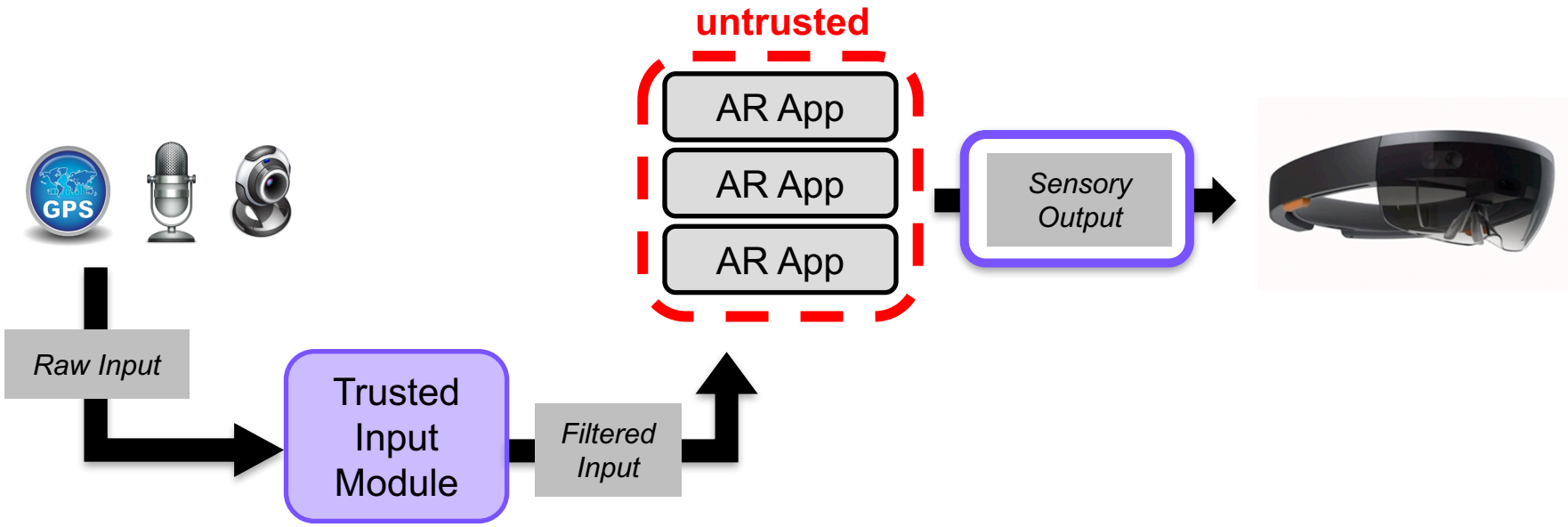
AR Input Privacy



Input Privacy

- Jana et al., USENIX Security '13
- **Roesner et al., CCS '14**
- Templeman et al., NDSS '14
- Raval et al., MobiSys '16

AR Output Security

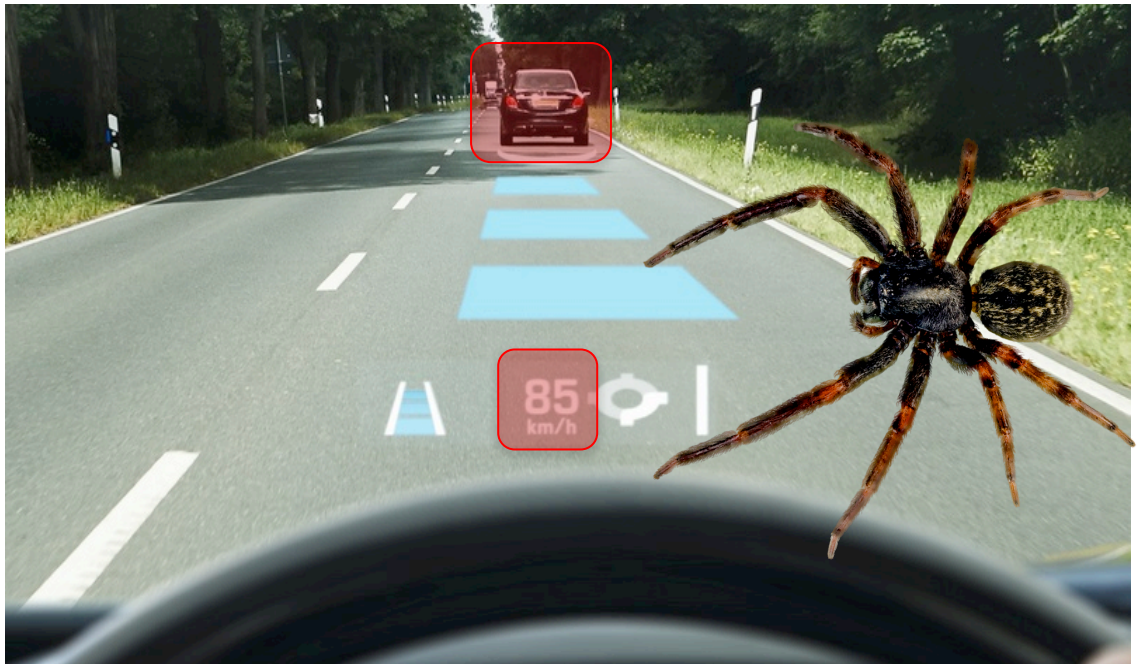


Hyper Reality (https://www.youtube.com/watch?v=YJg02ivYzSs)

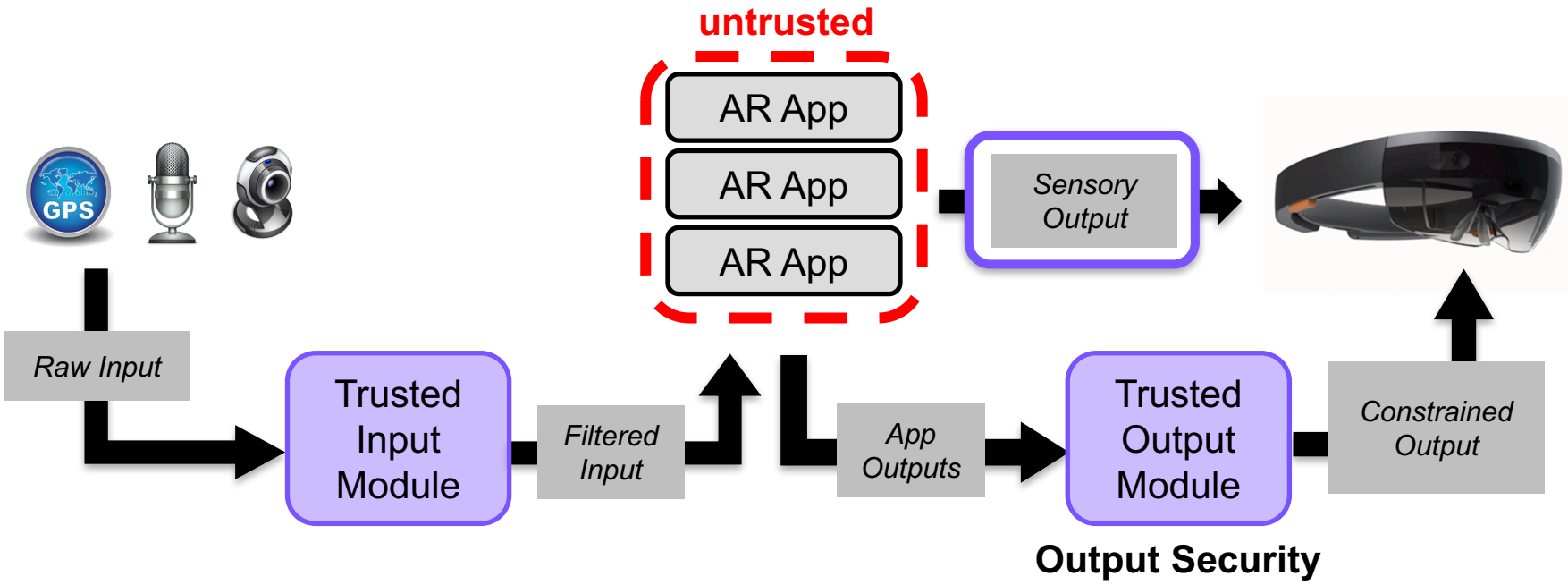
AR Output Security

A buggy or malicious app might…

- **Obscure another app's virtual content** to hide or modify its meaning
- **Obscure important real-world content,** such as traffic signs or cars
- **Disrupt the user physiologically,** such as by startling them



AR Output Security



Output Security

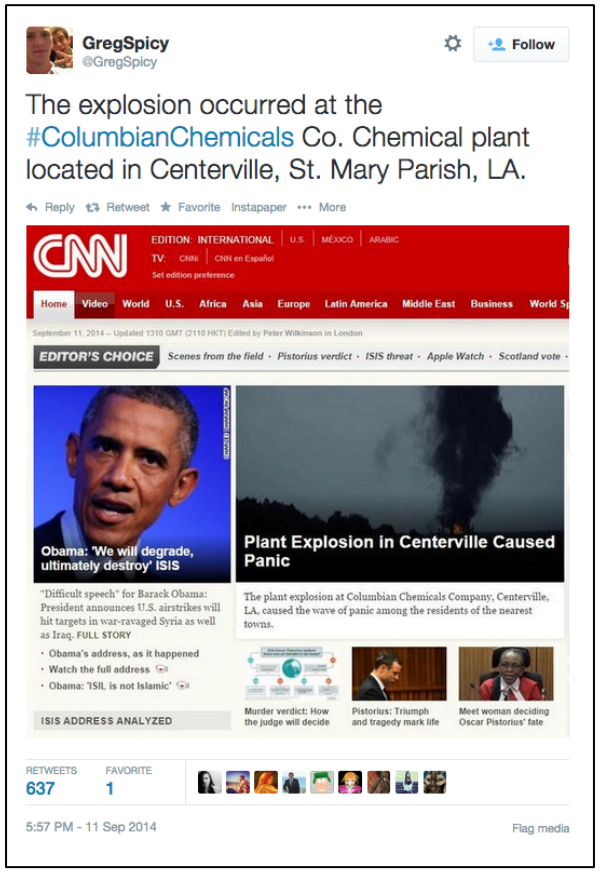
- **Lebeck et al., HotMobile '16**
- **Lebeck et al., IEEE S&P '17**
- **Lebeck et al., HotMobile '19**

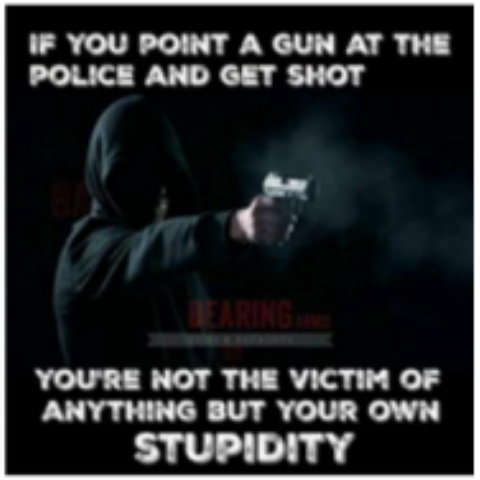
Many Other Questions

- How to handle multiple apps augmenting reality at the same time?
- How to handle interactions between multiple users who may see different realities?

https://ar-sec.cs.washington.edu

(3) Technology-Enabled Disinformation





Right-hand examples from Arif et al., CSCW 2018

Serious Potential Consequences

Facebook uncovers disinformation campaign to influence US midterms

Social network removes 32 pages and accounts for 'co-ordinated inauthentic behaviour'

Hannah Kuchler in San Francisco and **Demetri Sevastopulo** in Washington JULY 31, 2018

How WhatsApp Destroyed A Village

In July, residents of a rural Indian town saw rumors of child kidnappers on WhatsApp. Then they beat five strangers to death.

Pranav Dixit
BuzzFeed News Reporter

Ryan Mac
BuzzFeed News Reporter

Reporting From
New Delhi

Posted on September 9, 2018, at 9:00 p.m. ET

Lots of Types of "Fake News"

	Satire	False Connection	Misleading Content	False Context	Imposter Content	Manipulated Content	Fabricated Content
Poor journalism		✔	✔	✔			
To Parody	✔				✔		✔
To Provoke or to 'punk'					✔	✔	✔
Passion				✔			
Partisanship			✔	✔			
Profit		✔			✔		✔
Political Influence			✔	✔		✔	✔
Propaganda			✔	✔	✔	✔	✔

From Claire Wardle, https://medium.com/1st-draft/fake-news-its-complicated-d0f773766c79

What's New?
The Technology, Not the Incentives

- How content is created
  - Scale and democratization
  - Automated fake content creation
    - Video: https://grail.cs.washington.edu/projects/AudioToObama/
    - Text: https://rowanzellers.com/grover/
- How content is disseminated
  - Scale and democratization
  - Tracking and targeting
  - Algorithmic curation
  - Anonymity and bots
  - Immediate reach and feedback
- How content is consumed
  - Attention economy
  - Filter bubbles

Not Just a Technical Problem: Human Cognitive Vulnerabilities

(e.g., confirmation bias, backfire effect)

WRAP-UP

This Quarter

- Overview of:
  - Security mindset
  - Software security
  - Cryptography
  - Web security
  - Web privacy
  - Authentication
  - Mobile platform security
  - Usable security
  - Physical security
  - Anonymity
  - Smart home security
  - Side channels
  - Adversarial ML
  - Security for emerging tech

Lots We Didn't Cover…

- Really deep dive into any of the above topics
- (Most) Network security
- (Most) Traditional OS security
- (Most) Recent attacks/vulnerabilities
- (Most) Specific protocols (e.g., SSL/TLS, Kerberos)
- Access control
- Spam
- Malware / Bots / Worms
- Social engineering
- Cryptocurrencies (e.g., Bitcoin)
- Other emerging technologies
- …

Thanks for a great quarter!

- Feel free to still email / stop by
  - Worksheets?
- Not ready to be done?
  - CSE 481SEC Security Capstone in the fall
  - CSE 490 Cryptography in the fall

- Please fill out course evaluation: https://uw.iasystem.org/survey/209151