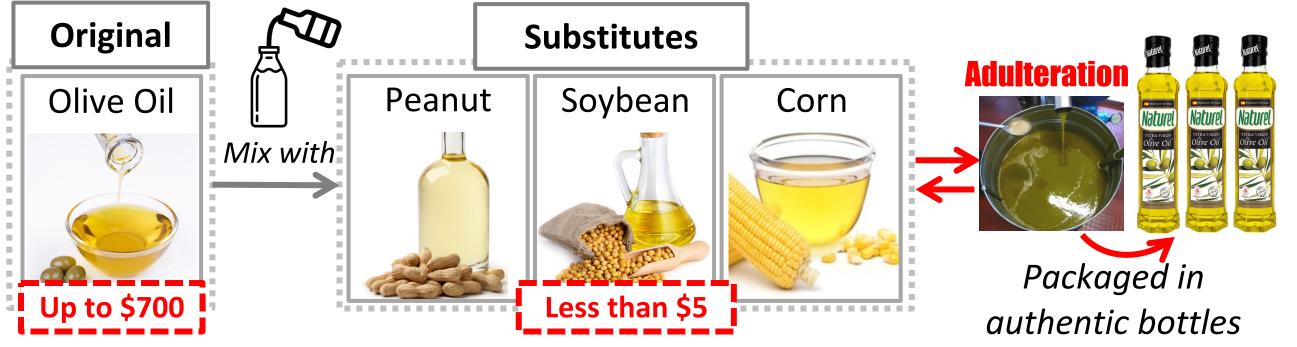
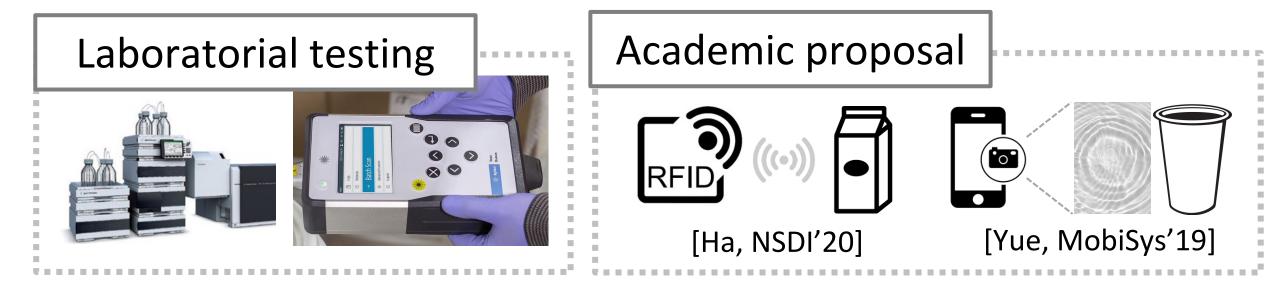
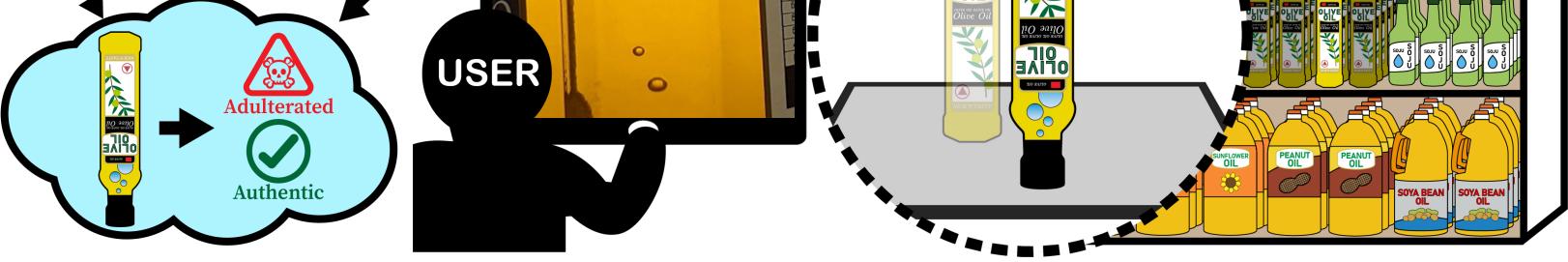
On Utilizing Smartphone Cameras to Detect Counterfeit Liquid Food Products Project Bangjie Sun, Sean Rui Xiang Tan, Zhiwei Ren, Mun Choon Chan, Jun Han* Nebsite 2. Our Solution: LiquidHash 1. Problem • Counterfeit Liquid Food Products: • Verifying authenticity of liquid food products *without opening* bottles and using only smartphone cameras o Widespread and dangerous O Difficult to detect by an average consumer **Observed bubble** SUPERMARKE Food and beverages: fighting Food Fraud Costs the Global Food Death By Fake Alcohol C Industry \$10-15 Billion Annually counterfeits worldwide characteristics The ASEAN Post Team Haydn Simpson 🖶 Print article 16 January 2021 18 May 2017 0 safety of people around the world who are ofter unsuspectingly buying these potentially very dangerous aoods " These are the words of Michael Ellis, head of Manufacturer's INTERPOL's Trafficking in Illicit Goods Unit. commenting or Operation Opsen V, which saw the seizure of more thai Cloud 10.000 tons and 1 million litres of hazardous fake food and drink. This brings home the stark reality of the burgeoning

Adulteration is Main Source of Counterfeits
 Replace a large portion of liquid with substitutes
 Package in authentic bottles and seal to standards



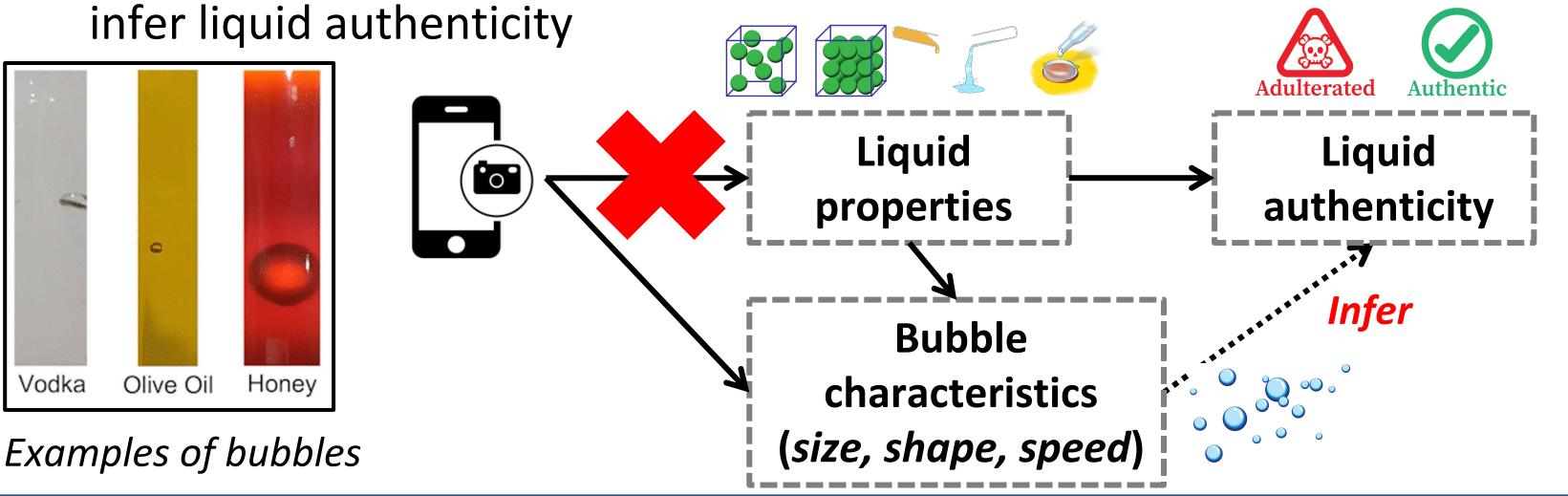
- State-of-the-art Solutions are Limited
 - Require costly and specialized equipment
 - Require opening of bottles and controlled settings





Insights

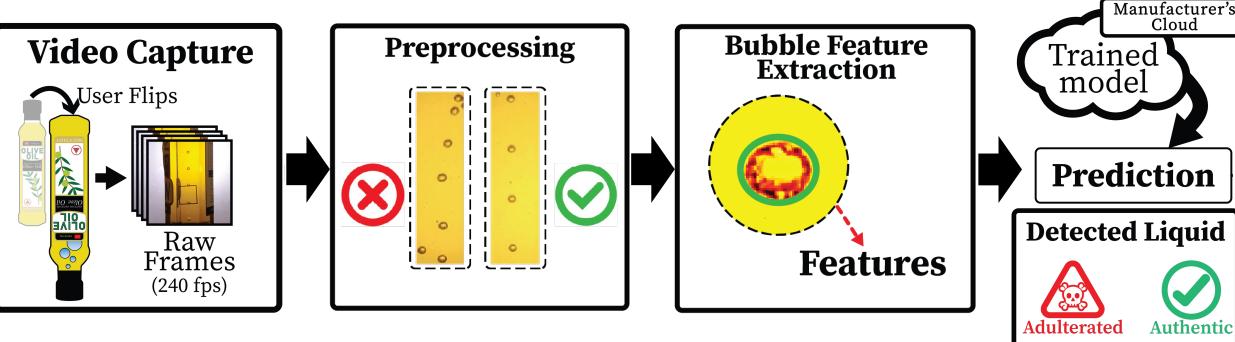
- Each type of liquid has unique liquid properties
- Direct measurement is impractical with smartphone cameras
- Utilize observed bubble characteristics -- size, shape and speed -- to



4. Evaluation

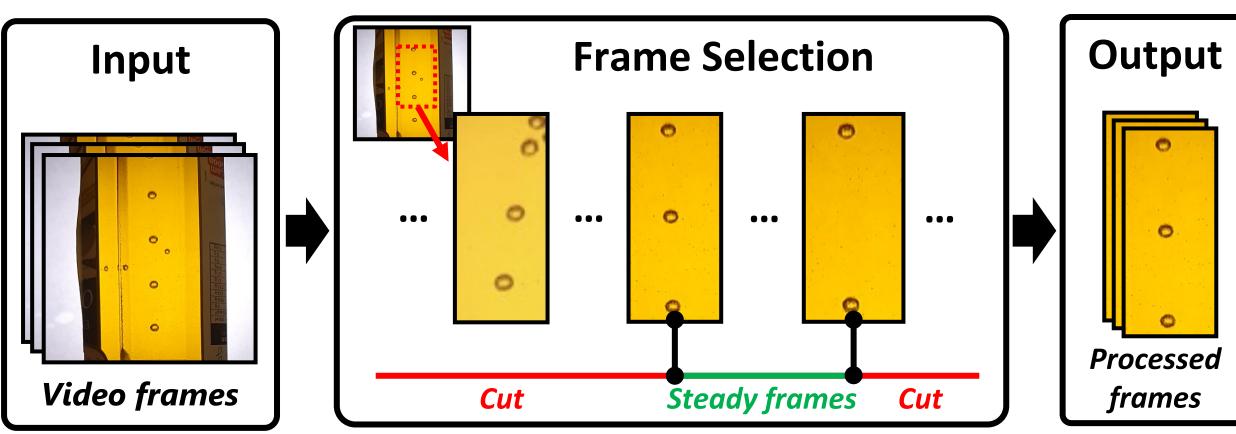
3. System Design





• Pre-processing Module

O Filter video frames using image processing techniques
O Obtain bubble characteristics consistent across tests

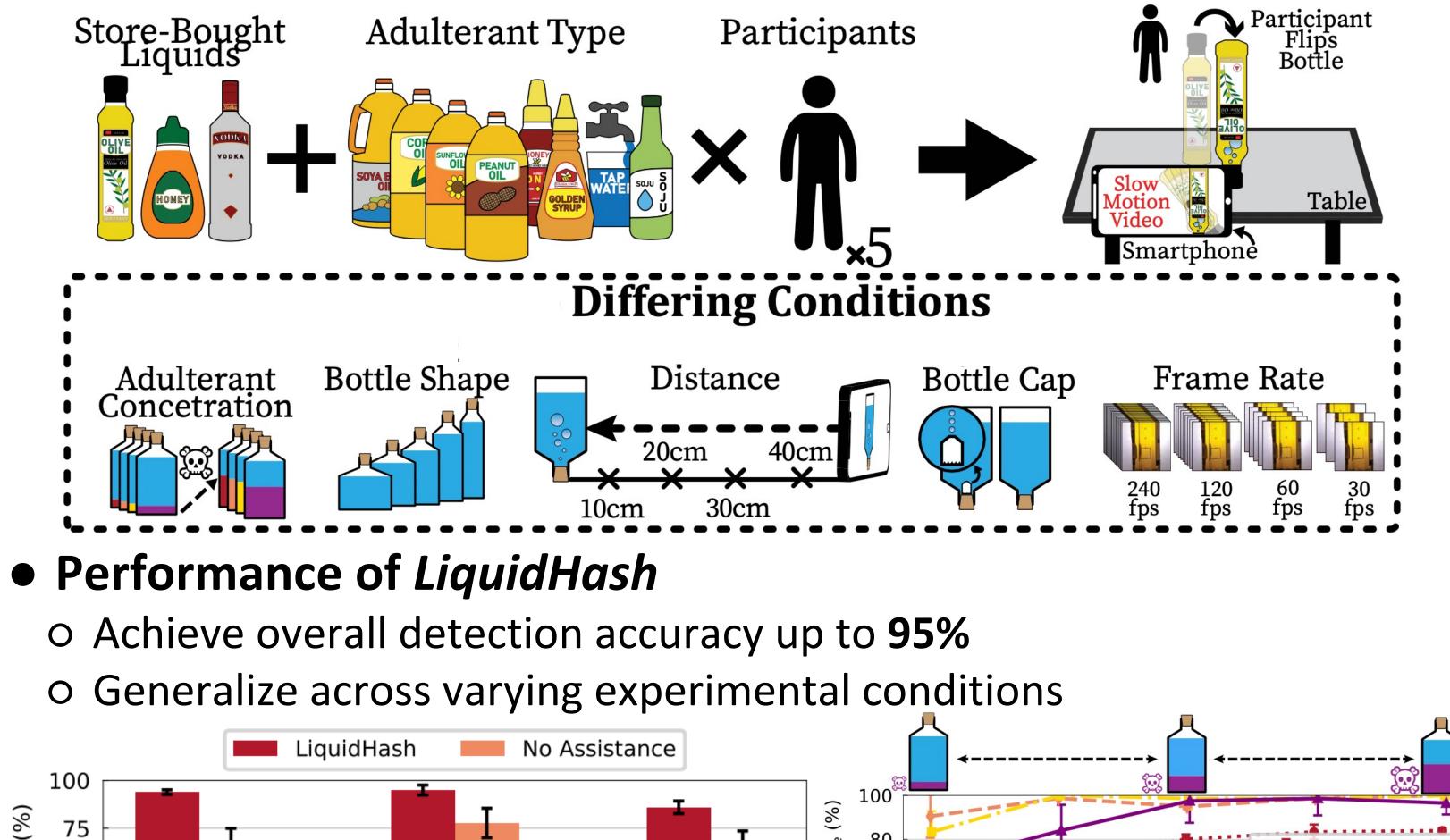


• Bubble Feature Extraction Module

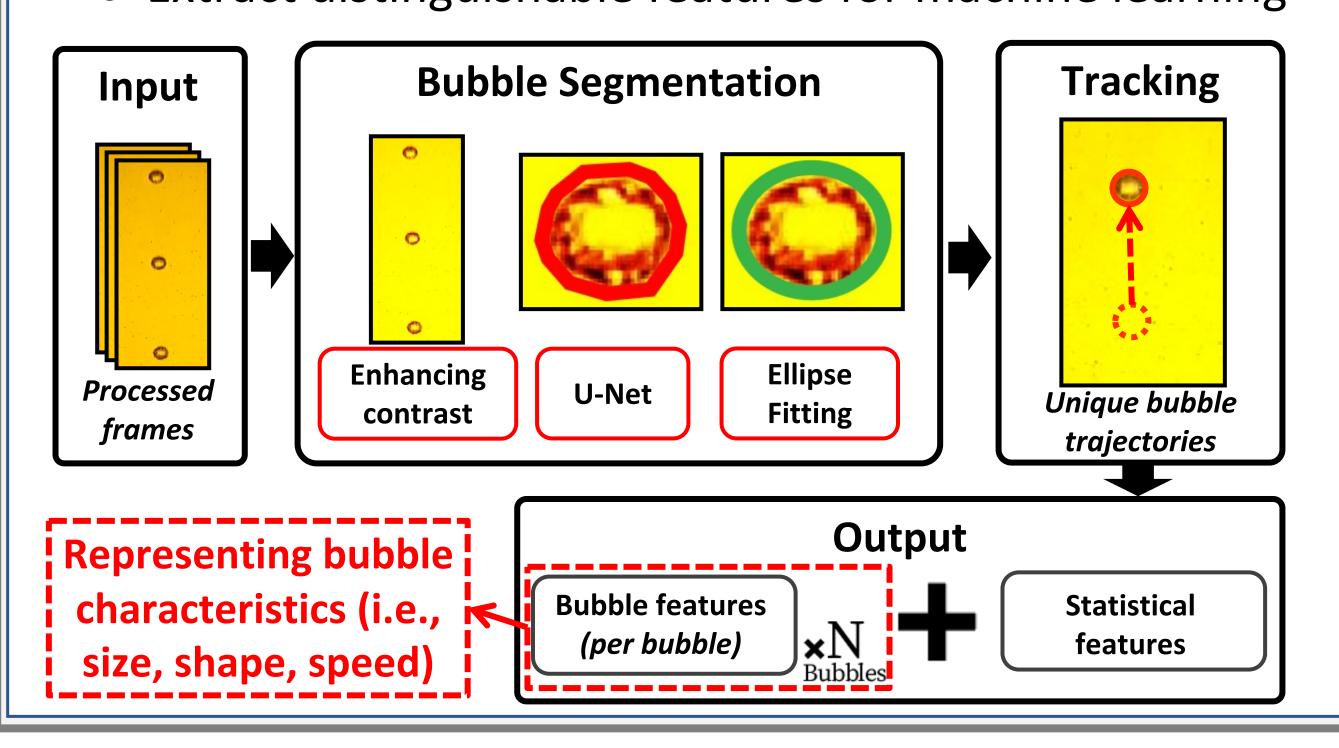
• Experiment Setup

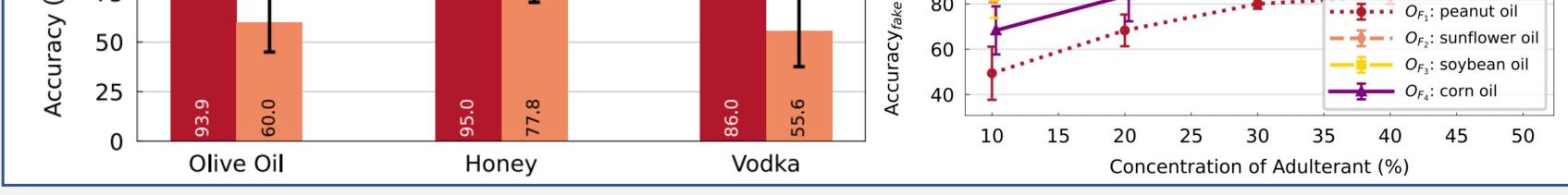
o **11** instances of authentic and adulterated liquids

o 350 tests across 5 participants



Obtain fine-grained bubble segmentation O Extract distinguishable features for machine learning





5. Discussion

Deployment Considerations

O Verifying product integrity in supply chain
 O Upload videos to servers for verification

• Limitations

- o Powerful counterfeiters
- O Opaque bottles and liquids





Producers







Distributers

