IOWA STATE UNIVERSITY

Department of Electrical and Computer Engineering

Application Exploration of 5G-and-Beyond Wireless Systems and Rural Broadband

Client/Advisor: *Dr Hongwei Zhang*
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Meet the Team

Samuel Rettig
Software Engineer

Vibhu Dhavala
Software Engineer

Cristofer Espinoza
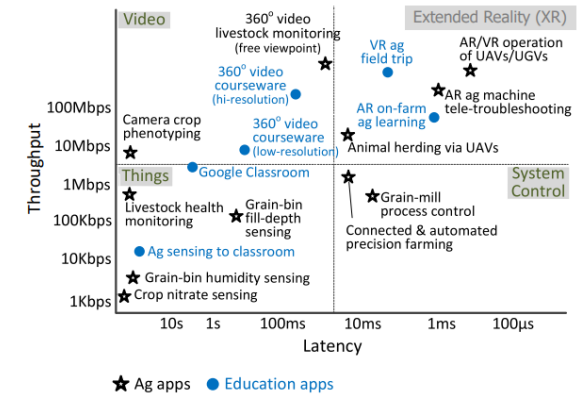Electrical Engineer
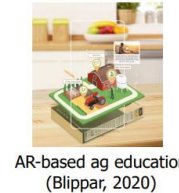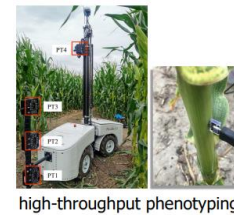
Caleb Kitzelman
Electrical Engineer

Jake Roskopf
Electrical Engineer

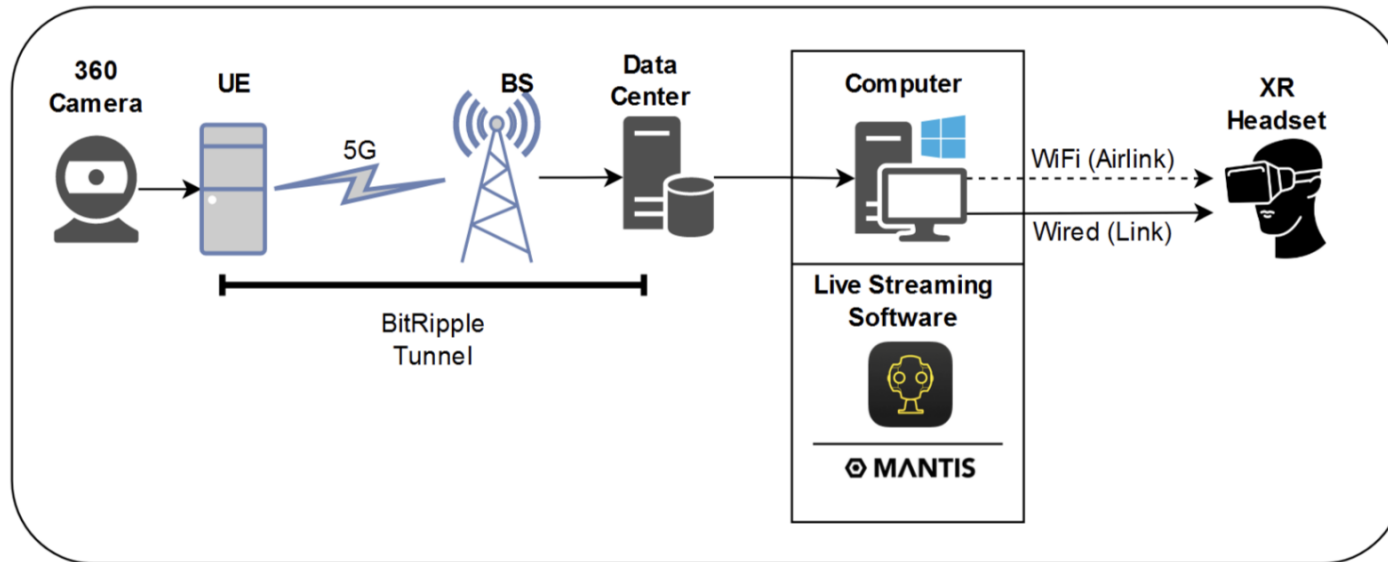**Andrew French**
Electrical Engineer

ARA & Project Background

- ## 5G works, why ARA?
  - "... wireless living lab for smart and connected rural communities, enabling the research and development of rural-focused wireless technologies ..."
- ## Led by Dr. Hongwei Zhang
- ## Launched Sept 6th
  - ARAportal, access resources and perform experiment

high-throughput phenotyping

precision livestock farming

agriculture automation

AR-based ag education (Blippar, 2020)

Project Summary

- Create XR Application in Unity

Semester Goals

Add the capability to stream Real-Time Streaming Protocol (RTSP):
- Current application uses HTTP Live Streaming (HLS)

     *Not made by ARA so cannot change
- UE with 360 camera uses RTSP
  - Extremely low latency
- Determine if ARA network allows for reliable real-time streaming

Semester Goals

Create an application in Unity to visualize 360 camera stream

- User experience (responsiveness, interfacing, …)
- UI to switch between different camera feeds to reduce throughput and improve performance.
- RTSP will be more reliable as a result.

Technical Challenges

- Unity software
    - Development of application
    - Data collection capabilities
- Insta360 Pro
    - 2 camera setups
    - How to replicate in field vs development
- Streaming Protocol (HLS vs. RTSP)

Technical Challenges

- HLS (HTTP Live Streaming) vs. RTSP (Real-time Streaming Protocol)

HLS (Current Application)	RTSP (Developed Application)
High Compatibility with devices and operating systems	Designed for streaming over private networks
High quality video streams through use of ABR (adaptive bitrate streaming)	Adaptive streaming not supported -> lower quality video (prone to packet loss or jitter)
Very high latency from buffering and segmenting data before delivering to client	Allows streaming before entire video is captured -> Low-latency and real-time video

Timeline

Task	Aug.	Sept.	Oct.	Nov.	Dec.
Research into 5G XR and video streaming	████	████			
XR video streaming via RTSP protocol		████	████		
Create UI for application via Unity			████	████	████
Application improvement				████	████

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