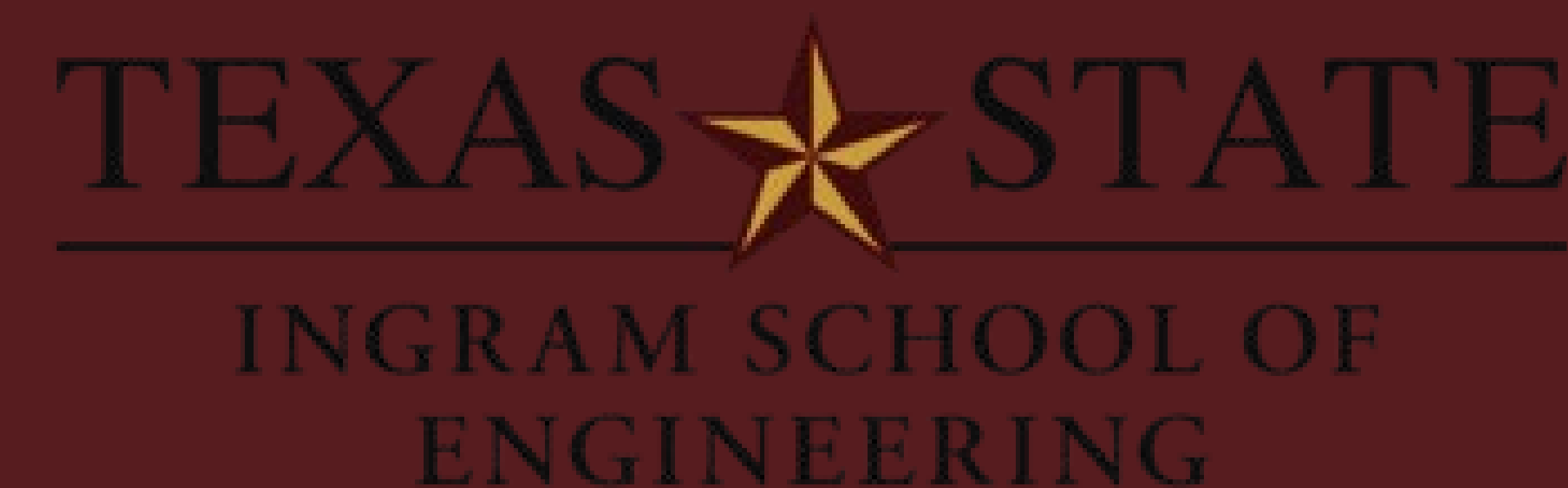


E1.01 Light-Fidelity System (Li-FiS)

Electro-Magicians

Patrick Towner (PM), Yasmin Baqdounes, Nathan Boldt,
Rupendra Rana Chhetri



BACKGROUND

The Electro-Magicians are investigating light-fidelity technology to demonstrate a prototype proof-of-concept of an optical wireless communication system that uses light to send and receive information. The high-speed data transfer occurs between a current-driven light source and a photo-detecting device from which the light signal is amplified and processed to communicate commands to and from other systems. Like Wi-Fi, Li-FiS can stream content from a server and the internet. Using Li-Fi technology is a viable option for future human spaceflight missions in a spacecraft or space habitat by providing advantages (over Wi-Fi) related to data transfer speeds and electromagnetic interference.

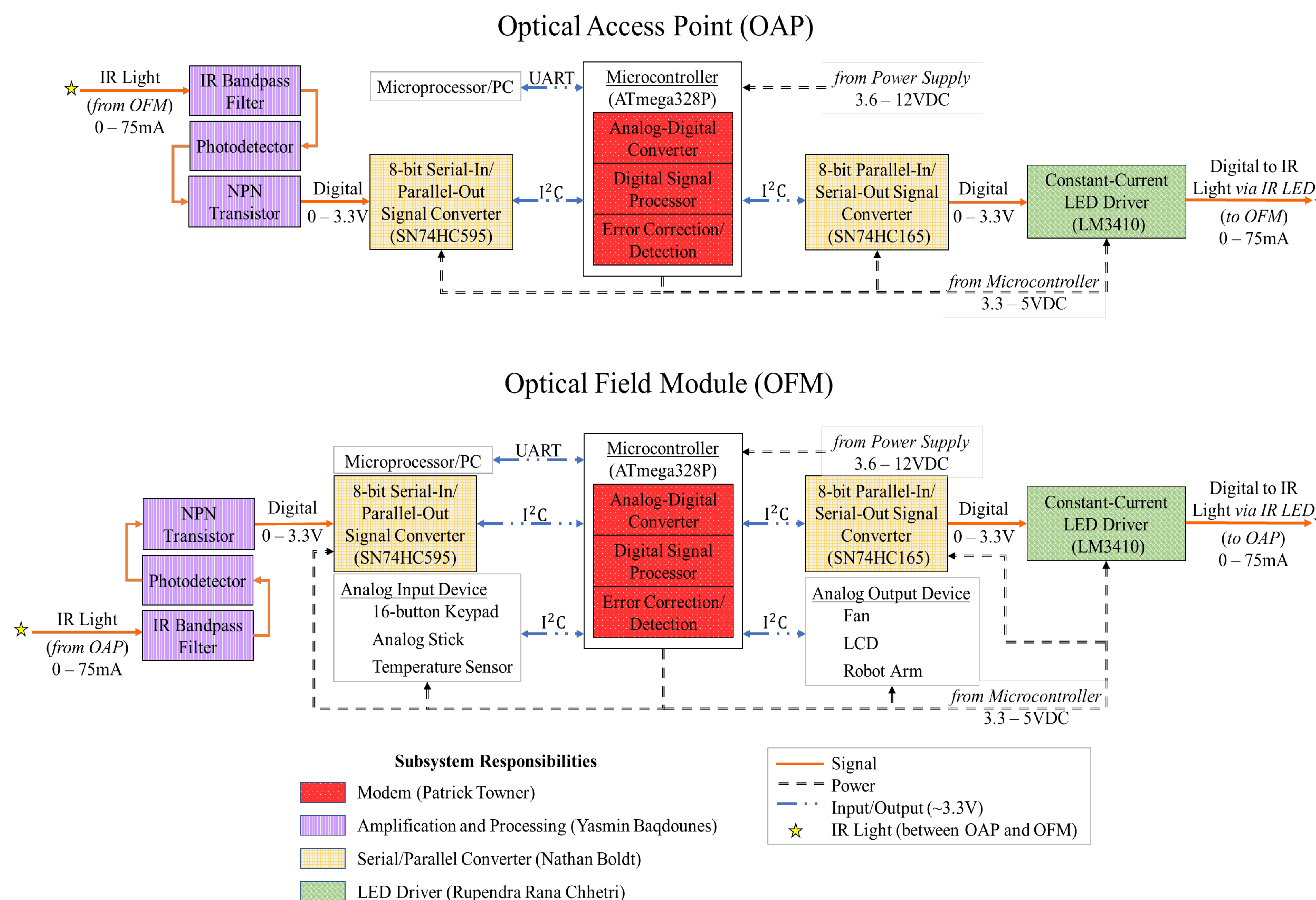
DESIGN CHALLENGES

- Interference – uplink service vs. downlink signal (crosstalk), external/outdoor light sources, physical obstructions
- Coverage and Directionality – limited to line-of-sight, additional/more complex components required to extend network range
- Mobility – horizontal handover (WLAN-to-WLAN), vertical handover (between Li-Fi and Wi-Fi)

OFM APPLICATION SELECTION

- Temperature sensor to control fan operation at specific temperatures and display current temperatures on an LCD screen
- Analog stick to control the motion of a robotic arm
- Keypad to send text information to an LCD screen

TOP-LEVEL BLOCK DIAGRAM



PRODUCT FEATURES

- Capacity:** The near-infrared light spectrum, from 215 THz to 430 THz, allows over **700** times more available frequencies than the full RF bandwidth (0 to 30 GHz).
- Security:** Light signals can be contained and secure; They cannot be accessed outside line-of-sight and will not penetrate walls or any obstruction of light.
- Speed:** A data transmission rate of up to **15.73 Gbps** can be achieved over 1.6 meters.
- Versatility:** A Li-Fi network is implemented by using off-the-shelf parts, i.e., infrared LED, microprocessor, integrated circuit, and combining or modifying overhead lighting to allow for Li-Fi communication.
- Hands-Free Operation [Stretch Goal]:** Voice commands are sent to the base station at the user's location, and it sends known commands to another Li-Fi transceiver in another area to control one or more systems using the Li-FiS in that location.

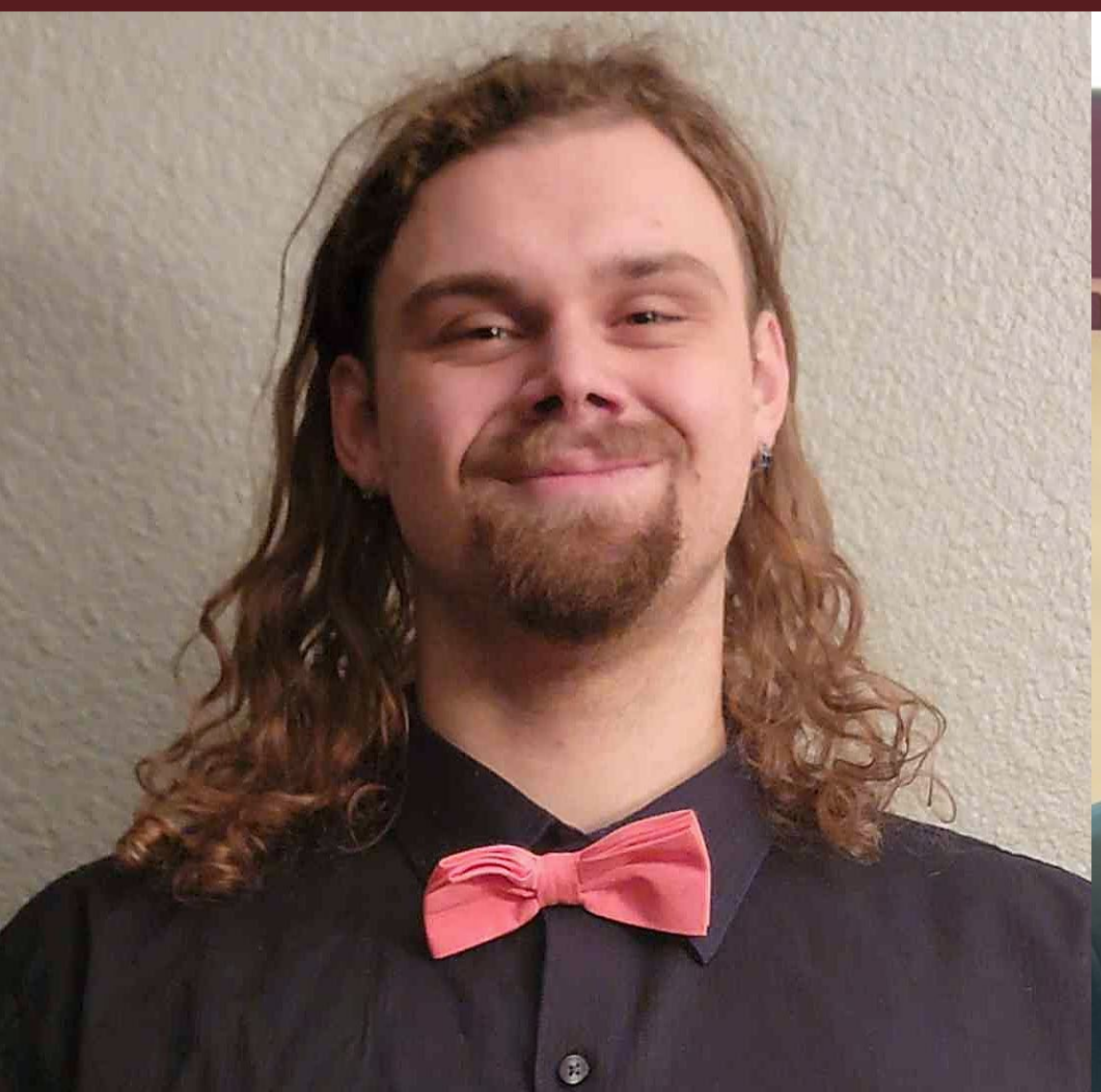
MEET THE TEAM



Patrick Towner



Yasmin Baqdounes



Nathan Boldt

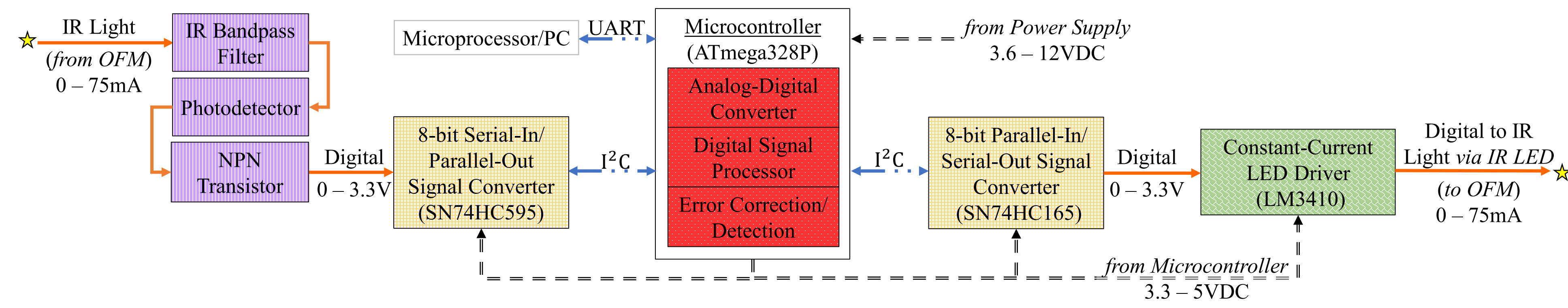


Rupendra Rana Chhetri

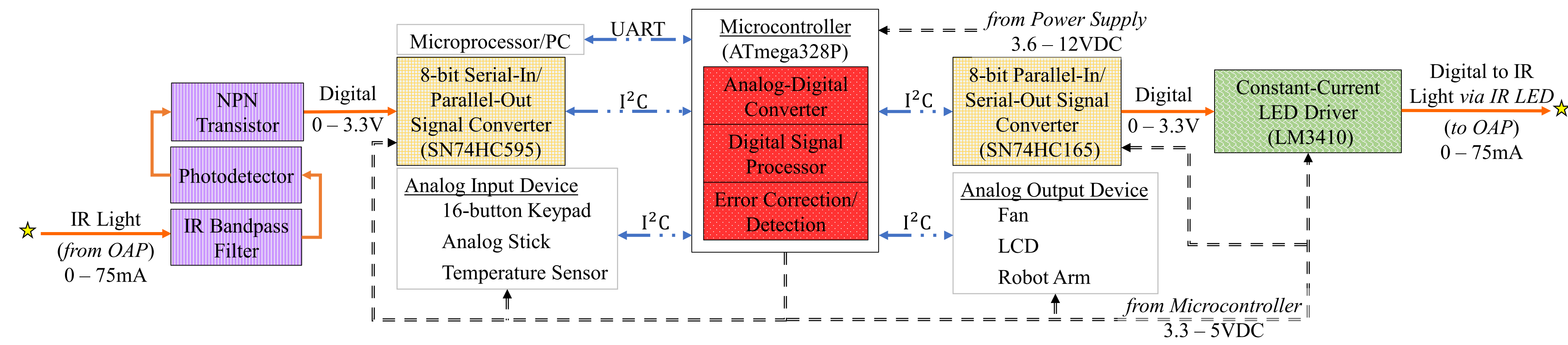
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- Principal Investigator:** Dr. Richard Compeau
- Texas State University Instructors:** Lee Hinkle, Jeff Stevens, Mark Welker
- Team Photon**

Optical Access Point (OAP)

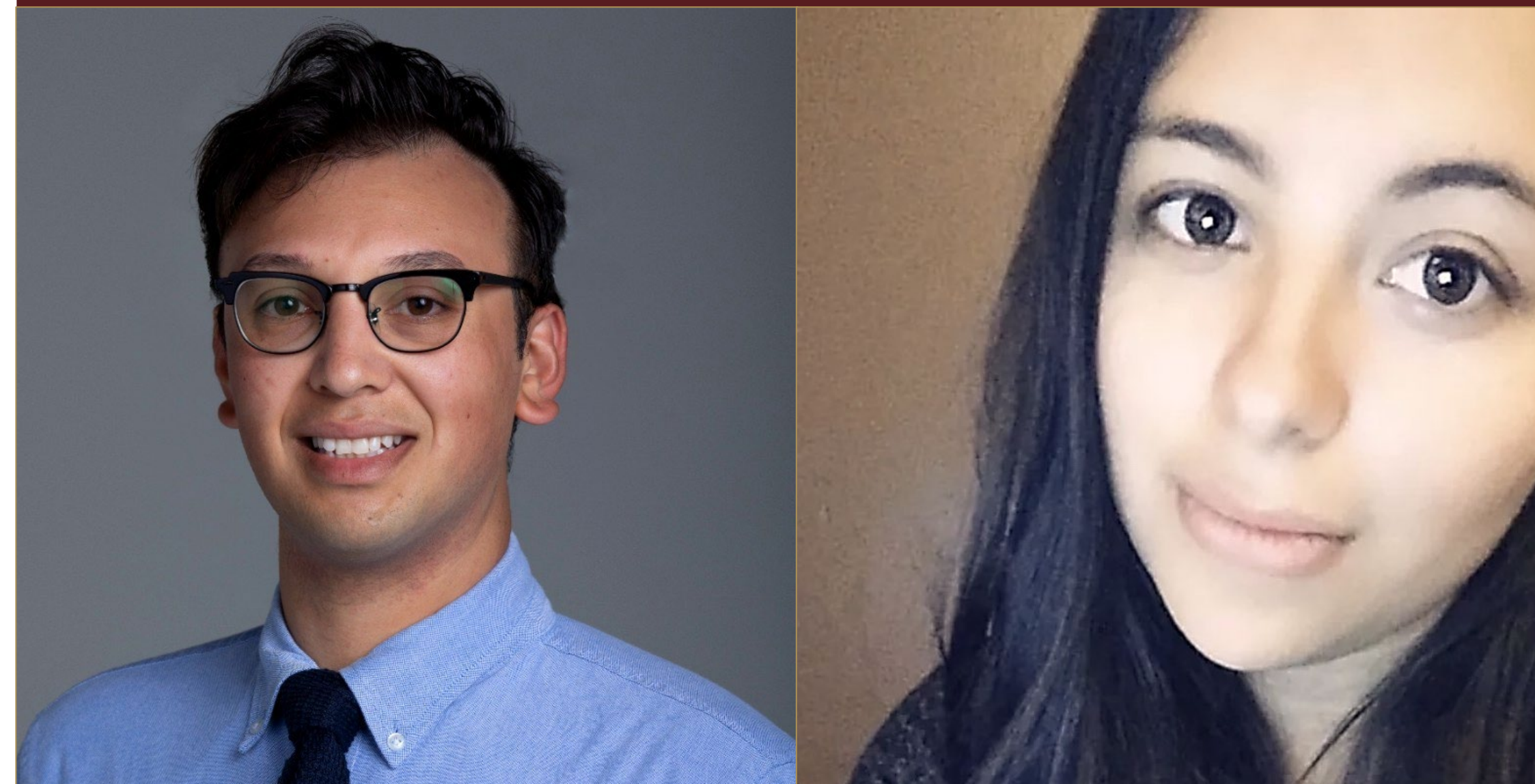


Optical Field Module (OFM)



- Subsystem Responsibilities**
- Modem (Patrick Towner)
 - Amplification and Processing (Yasmin Baqdounes)
 - Serial/Parallel Converter (Nathan Boldt)
 - LED Driver (Rupendra Rana Chhetri)
- Signal
- - - Power
- · - · Input/Output (~3.3V)
★ IR Light (between OAP and OFM)

ELECTRO-MAGICIANS



Patrick Towner, PM Yasmin Baqdounes



Nathan Boldt Rupendra Rana Chhetri

Overall Block Diagram