Abstract:
This faculty research team develops design projects in collaboration with University of Michigan Department of Ophthalmology and Visual Sciences, located at the Kellogg Eye Center. The aims are two-fold:

(1) to help ophthalmologists diagnose and treat patients and 
(2) to assist people with low vision to live a better and safer life.

The current projects include surgical devices, diagnostic tools, and assistive devices for people with low vision. The team currently has the following ongoing projects as examples:

Vision Assistive Device
This research designs products for people with low vision that can make activities of daily life, such as grocery shopping and operating appliances, much easier to perform. The user will be offered enhanced depth perception, as well as magnified images.

Vitreous Biopsy Device
This project is developing a novel medical device that can safely extract fluid from the eye. This fluid can yield useful data for diagnostic tests; however, the fluid is very difficult to extract safely without invasive procedures.

Eye Disease Simulator
This research is designing an augmented reality app that can simulate what a patient sees, or will see, as they develop one or more specific eye diseases. Patients and caregivers can sometimes have difficulty understanding how a disease will progress (and complying with treatment). Patients often have difficulty describing what they are seeing to clinicians. This app will allow patients, caregivers, and clinicians to experience what it is like to see the world with specific vision impairments.

First year through graduate students are welcome to apply, and all will be encouraged to stay on the team for more than the two-semester minimum. Leadership roles are available in the lab, and experienced students will be a natural fit for these positions as their knowledge grows over time.
Number of Students Sought:
9-13

Position Openings (with Subteam, if applicable)

<table>
<thead>
<tr>
<th>Project Area</th>
<th>Skills</th>
<th>Likely Majors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware Design (3 students)</td>
<td>Mechatronics/mechanical design, CAD modeling, basic machining, 3D printing</td>
<td>Mechanical Engineering Any</td>
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<tr>
<td>Electrical Design (3 students)</td>
<td>circuit design, PCB layout, wireless communication, instrumentation, image processing, microcontroller programming</td>
<td>Electrical Engineering Computer Science (CSE/CS-LSA)</td>
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<tr>
<td>Software Design (4 students)</td>
<td>Android app creation with Android Studio, graphical interface creation, Java coding</td>
<td>Computer Science (CSE/CS-LSA)</td>
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<td>Apprentice level (3 students) at freshman/sophomore level will be added to the above teams based on skills</td>
<td>See above</td>
<td>Any major</td>
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Meeting time and location:
The Assisted Vision team meets weekly and a best time will be finalized once students are identified. Each subteam arranges a convenient time to meet and work together.

Team organization:
Each Assisted Vision subteam has a team leader that reports to and meets with the faculty PI. The teams are flexibly structured to enhance creativity and opportunity for student growth. We have the following project teams: Vision Assistive Device, Vitreous Biopsy Device, and Eye Disease Simulator.

Faculty Mentor: Lauro Ojeda
Assistant Research Scientist, Mechanical Engineering
Lauro Ojeda is an Assistant Research Scientist at the University of Michigan. He has over 19 years of experience in the fields of: inertial sensing, sensor data fusion, estimation techniques, Kalman filtering, biomechanics and human gait analysis. Ojeda started his career in the field of robot localization systems combining dead-reckoning and inertial sensing, and he later moved to the field of human positioning estimation. Ojeda was the first to propose a practical approach for inertial-based personal localization, which is currently used widely across the world. His work in this field was later adapted to biomedical applications, specifically unrestrictive gait analysis and is being used in several labs at the University as well as other research centers and commercial companies. Ojeda has over 40 papers and four patents in the field of position estimation and inertial sensing.