

SYSC 4907 – Fall 2026/Winter 2027

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| Supervisor | James Green |
| Co-supervisor | |
| Course section | SYSC 4907 F |
| Project ID | F1 |
| Project title | Instrumented infant/child car seat |
| Project description | <p>Explore the use of flexible pressure sensors and a camera for monitoring an infant/child in a car seat. Could look at respiration rate, heart rate, wake/sleep state, agitation, etc. Could include a simple mobile app for the driver, with alerts. Could involve construction of a manikin for simulating vital signs.</p> <p>Requires strong software and hardware skills, and self-motivation.</p> |
| Program(s) | Biomedical and Electrical Computer Systems Software |
| Maximum number of students | 5 |
| Meeting time with supervisor (optional) | |
| Do you want the student to contact you before the office assign this project to them ? (Yes/No) | Yes |

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| Supervisor | James Green |
| Co-supervisor | |
| Course section | SYSC 4907 F |
| Project ID | F2 |
| Project title | Equitable detection by autonomous vehicles |
| Project description | <p>Collect and examine LiDAR and video data of pedestrians using various forms of mobility aids. Use these data to confirm whether state-of-the-art pedestrian detection models, used by autonomous vehicles and other intelligent systems, can recognize all pedestrians, regardless of their mobility needs. Potentially extend existing models to overcome identified challenges.</p> <p>Good starting ref: "Ensuring Safety, Equity and Accessibility in Detection, Collision Algorithms and Data Collection" Brief by Ian Moura for the Disability Rights Education & Defense Fund</p> <p>Requires strong software and hardware skills, an interest in research, and self-motivation.</p> |
| Program(s) | Biomedical and Electrical Computer Systems |

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| | Software |
| Maximum number of students | 3 |
| Meeting time with supervisor (optional) | |
| Do you want the student to contact you before the office assign this project to them ? (Yes/No) | Yes |

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| Supervisor | James Green |
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| Course section | SYSC 4907 F |
| Project ID | F3 |
| Project title | Neonatal time series vital sign representation learning and outcome prediction |
| Project description | <p>"Discovery of signatures of fatal neonatal illness in vital signs using highly comparative time-series analysis" by Justin C. Niestroy has a dataset of multiple vital signs for 5K infants in NICU. Develop a multimodal MAE encoder for vital sign time series, perhaps using a Jumbo CLS token (see Fuller et al; ICLR2026) to improve on vital sign simulation and outcome prediction. Niestroy et al used a subset to develop risk of death predictor. Could confirm that MAE-Jumbo encoder outperforms their model.</p> <p>Requires strong software skills, keen interest in ML research, and strong self-motivation. This will be a difficult project.</p> |
| Program(s) | Biomedical and Electrical Computer Systems Software |
| Maximum number of students | 3 |
| Meeting time with supervisor (optional) | |
| Do you want the student to contact you before the office assign this project to them ? (Yes/No) | Yes |

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|---------------------|---|
| Supervisor | James Green |
| Co-supervisor | |
| Course section | SYSC 4907 F |
| Project ID | F4 |
| Project title | Neonatal patient simulator and LLM summarizer |
| Project description | Extend our lab's research in the area of neonatal patient simulation (vital sign data, discrete clinical intervention events, etc.) and LLM-based |

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| | <p>patient status and care summarization. We wish to simulate realistic neonatal patients and then summarize their health condition and history of care for various users, including clinicians, parents, and the electronic health record.</p> <p>Requires strong software skills, an interest in self-directed learning of machine learning. This is a research-focused project that requires self-motivation.</p> |
| Program(s) | Biomedical and Electrical Computer Systems Software |
| Maximum number of students | 3 |
| Meeting time with supervisor (optional) | |
| Do you want the student to contact you before the office assign this project to them ? (Yes/No) | Yes |

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|---|---|
| Supervisor | James Green |
| Co-supervisor | |
| Course section | SYSC 4907 F |
| Project ID | F5 |
| Project title | Adding audio to video-based clinical intervention detection |
| Project description | <p>Our lab has previously developed machine learning models for examining videos of team-based clinical care and classifying which interventions are being administered. We now wish to add audio and potentially other sensors to the dataset and detection models. Will require collecting your own simulated patient care data, evaluating state-of-the-art multimodal deep learning models, and extending them.</p> <p>Requires strong software skills and self-motivation!</p> |
| Program(s) | Biomedical and Electrical Computer Systems Software |
| Maximum number of students | 3 |
| Meeting time with supervisor (optional) | |
| Do you want the student to contact you before the office assign this project to them ? (Yes/No) | Yes |

