DIVYANSH GUPTA

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Design and Control of an Ankle Exoskeleton *(Master's Thesis)*

Design
- Designed unidirectional series elastic actuator with 60Nm peak torque
- Utilized composite flexures for passive range of motion at ankle joint
- Non-linear spring behaviour via CAM mechanism for low-torque control

Controller
- Used deep-learning for predicting biological torque from wearable sensor
- Tested different neural net (DNN, LSTM, TCN with ResNet) in TensorFlow
- Used Bayesian optimization for hyperparameter tuning; improving RMSE
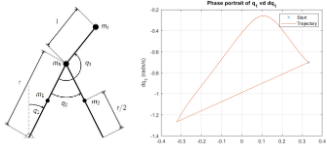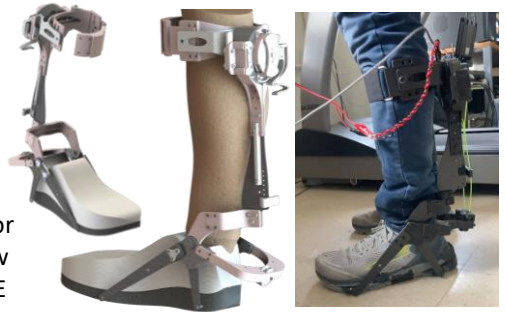
Controller for a 3-link biped (2023)
- Used Hybrid Zero Dynamics for parametrization and control design
- Optimization-based foot trajectory
- Simulated linearized full-state feedback

Road Sign Detection and comparative analysis of SLAM and V-SLAM (2022)
- Implemented RTABMap on KITTI data and used YOLO-v5 to detect road-signs
- Compared performance with ORB-SLAM3, LeGOLOAM and HDL-Graph

Analysis of sensors in autonomous vehicles (IMU, GPS, LiDAR, Camera)

- Create custom ROS-drivers for IMU & GPS
- Conducted sensor noise analysis for IMUs
- Applied signal processing techniques
- Tested feature detectors for image stitching
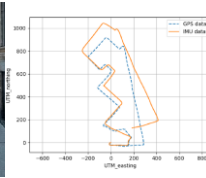
Autonomous Delivery Robot
Robotics Design Engineer
OttonomyIO (2021-2022)

- Improved modularity and sensor placement in robot
- Mechanism for snow mobility
- Thermal management system
- Supervised robot integration

Chitrak - Quadruped *(2018)*
Designed and prototyped an energy-efficient quadruped using self-locking actuators
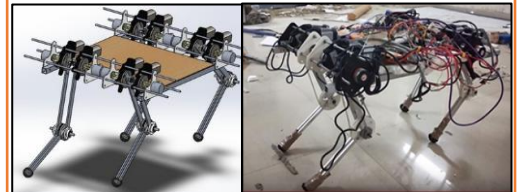
Other Projects

- Low-cost wearable device for predicting knee osteoarthritis
- Redesigning Crutches (2nd prize Biomedical Innovation challenge)
- Automated Toilet Cleaning robot (3rd prize in Inter-IIT Tech Meet)
- Butler Robot – Restaurant the future
- External sole to minimize risk of falling among geriatrics
  (Reimagine Health Hackathon – 1st position and cash prize of $150)
- Omni directional platform with manipulator arm

Ottobot – Ottonomy IO

Butler Robot and Quadruped

Collecting GPS and RTK-GPS data

Autonomous Toilet Cleaning Robot