Honda Research Institute USA (HRI-US) strives to be at the cutting edge of Honda's research and development activities. Driven by Honda's global slogan – The Power of Dreams – we pursue emerging technologies and bring them into reality to make people happy by engaging daily in highly scientific, pioneering work. We realize that dreams don't come from organizations, systems, or money. They come from people, and we seek people who have such a challenging spirit to join us.

Currently, HRI-US (Silicon Valley) is offering summer research internships to highly motivated Ph.D. (and qualified M.S.) students. Interns will work closely with HRI researchers, and publishing results in academic forums is highly encouraged. We are looking for candidates with good publication track records and excellent programming skills to join our team!

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**How to Apply:** Please send an e-mail to careers@honda-ri.com with the following:

- Subject line including the job number(s) you are applying for
- A cover letter explaining how your background matches the qualifications
- Recent CV
- Topics you are interested in (optional)

Candidates must have the legal right to work in the U.S.A.

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**List of Jobs:** Follow the link for detailed job description

**Robotics**

Human-Centered Collaborative Manipulation using Machine Learning (Job Number: P20INT-01)
Perception for Robotic Manipulation (Job Number: P20INT-02)
Analog and Digital Signal Processing (Job Number: P20INT-03)
In-Hand Manipulation (Job Number: P20INT-04)
Physical Human-Robot Interaction (Job Number: P20INT-05)
Robotic Interactive Planning (Job Number: P20INT-06)
Social Navigation Research (Job Number: P20INT-07)

**Human-Machine Interaction**

Human Behavior Modeling (Job Number: P20INT-08)
Integrations Engineer for Demonstrable Systems (Job Number: P20INT-09)
System Development for Next Generation Mobility Interfaces (Job Number: P20INT-10)
Computational Models for Human-Aware Systems (Job Number: P20INT-11)
Vision and Language Navigation (Job Number: P20INT-12)
Multimodal Signal Processing for Human State Estimation (Job Number: P20INT-13)

**Computer Vision**

Human Activity Recognition and Forecasting (Job Number: P20INT-14)
Human Behavior Understand and Prediction (Job Number: P20INT-15)
Anomaly Detection in Traffic Scenes (Job Number: P20INT-16)
Human Object Physical Interaction Detection (Job Number: P20INT-17)
Video Captioning in Traffic Scenes (Job Number: P20INT-18)
Visual Understanding of Traffic Scenes (Job Number: P20INT-19)

**Machine Learning/AI**

IRL and Control Research (Job Number: P20INT-20)
Learning and Control Research (Job Number: P20INT-21)

## Robotics

### Human-Centered Collaborative Manipulation using Machine Learning (Job Number: P20INT-01)

This position focuses on formulating and developing algorithms, and running experiments to advance research in human-centered robotic manipulation in the context of home robotics. You are expected to:

- Develop algorithms that allow robots to manipulate objects collaboratively with humans using learning from demonstration and reinforcement learning techniques
- Develop algorithms to estimate human state for collaborative manipulation
- Design and validate algorithms in simulation and on the real robot
- Design and conduct user studies of physical human-robot interaction

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, electrical engineering, or related field
- Experience in deep learning and other machine learning methods
- Good programming skills in either C++ or Python
- Experience in Robot Operating System (ROS)

**Bonus Qualifications:**

- Experience in manipulation, grasping, and motion planning
- Experience with deploying algorithm in real robots
- Experience with physics engines such as MuJoCo and Bullet

**Duration:** 3–4 months

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### Perception for Robotic Manipulation (Job Number: P20INT-02)

This title includes multiple positions. The focus of the research is to use vision and tactile sensor data to enable robots to robustly manipulate objects in unstructured environments using machine-learning approaches. You are expected to work in one of the following topics:

- Explore temporal approaches such as LSTMs to track the state of an object over time using tactile and vision data, exploiting finger-object contact information, e.g., slip
- Explore machine learning approaches to detect points-of-interest in articulated objects
- Explore deep reinforcement learning and learning from demonstration approaches to robotic manipulation

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, electrical engineering, or related field
- Experience in deep learning and other machine learning methods
- Good programming skills in either C++ or Python
- Experience in Robot Operating System (ROS)

**Bonus Qualifications:**

- Experience with deep reinforcement learning and sim-to-real approaches
- Experience in manipulation, grasping and tactile sensing
- Experience with PyTorch and TensorFlow
- Experience with game engines such as Unity and Unreal Engine

**Duration:** 3–4 months

## Analog and Digital Signal Processing (Job Number: P20INT-03)

This position focuses on developing and prototyping embedded systems for readout and signal conditioning hardware for tactile sensors. You are expected to:

- Design mixed/analog/digital circuits for tactile sensor readout hardware
- Design schematics and multi-layer layout for readout circuit in Altium/OrCAD or other software
- Assemble and characterize PCBs (flex and rigid)
- Develop firmware in C/C++
- Develop high level API for data collection
- Design fixtures and components in SolidWorks

**Qualifications:**

- M.S. or highly qualified undergraduate candidate in electrical engineering, or related field
- Hands-on experience designing mixed signal, analog and digital circuits
- Understanding of op-amp circuits and analog to digital converters (SAR, Delta-sigma etc.)
- Experience in writing firmware for ARM core MCU
- Experience with SWD debugging
- Experience in designing multi-layer PCBs in Altium/OrCAD or other software
- Experience in soldering and assembling PCBs with surface mount components
- Experience using SolidWorks or other 3D CAD software
- Should be comfortable using benchtop equipment such as an oscilloscope, logic analyzer, etc.

**Bonus Qualifications:**

- Familiarity using Capacitance to Digital converters such as AD7745/46
- Familiarity with ATMEL/Cypress MCUs with built in touch sensor capabilities
- Familiarity with Sigma-Delta ADCs
- Familiarity with python and Matlab
- Familiarity with Flex PCB, FFC, FPC

**Duration:** 3–4 months

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## In-Hand Manipulation (Job Number: P20INT-04)

This internship focuses on development, implementation and validation of planning and control algorithms for in-hand manipulation utilizing rolling and sliding contacts. The algorithms shall take advantage of both model- and learning-based approaches. You are expected to:

- Conduct literature survey on related work
- Formulate control and planning problems and choose appropriate approaches
- Design and implement the algorithms both in simulation and on hardware
- Prepare written and oral reports on the code and result

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, robotics, mechanical engineering, or related field
- Experience in robot kinematics/dynamics and force control
- Experience in machine learning techniques
- Excellent programming skills in C++ or Python

**Bonus Qualifications:**

- Experience in conducting hardware experiments using ROS

**Duration:** 3-4 months

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### Physical Human-Robot Interaction (Job Number: P20INT-05)

This internship focuses on development and implementation of algorithms as well as planning and execution of user studies related to physical human-robot interaction (pHRI) involving direct contacts between a human and robot. You are expected to:

- Develop and integrate hardware and software components required for human studies
- Model, design, and implement pHRI tasks
- Plan, prepare and execute pilot studies, and analyze their results
- Draft IRB applications
- Prepare written and oral reports on the results

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, mechanical engineering, or related field
- Experience in robot kinematics/dynamics and force control
- Experience in modeling human-robot interaction tasks
- Experience in user studies of human-robot interaction
- Excellent programming skills in C++ or Python

**Bonus Qualifications:**

- Experience in ROS
- Experience in human motion analysis and physiological sensing

**Duration:** 3–4 months

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### Robotic Interactive Planning (Job Number: P20INT-06)

Understanding and modeling human behavior is essential for operating robots in human environments, for example navigating an autonomous car safely through crowded streets. This position investigates using game theory and models of human cognition to negotiate with uncertain agents. You are expected to:

- Implement state-of-the-art game theoretic behavior algorithms on a robotic system.
- Research and develop methods for an autonomous system to strategize and learn about its interactions with other agents.

**Qualifications:**

- MS or PhD candidate computer science, or related STEM field
- Strong familiarity and research experience in cognitive modeling, planning, and control of robotic systems
- Highly proficient in software engineering using C++ and/or Python

**Bonus Qualifications:**

- Experience with deep learning software like TensorFlow or PyTorch
- Familiarity with ROS
- Hands on experience with robotic control

**Duration:** 3+ months

### Social Navigation Research (Job Number: P20INT-07)

This project focuses on social navigation; in particular, any of the following areas are important: data collection of human crowds, managing experiments of robot navigation in human crowds, developing human crowd simulators, developing novel algorithms for social navigation. You are expected to:

- Help collect data on human crowds
- Manage experiments of robots in crowds
- Develop models of navigation in crowds

**Qualifications:**

- M.S. candidate in computer science, electrical engineering, mathematics, statistics, psychology, cognitive science or human behavior related field
- Research experience in machine learning, behavioral research and human-computer interaction
- Excellent programming skills in either C++ or Python

**Bonus Qualifications:**

- Ph.D. candidate in computer science, electrical engineering, mathematics, statistics, psychology, cognitive science or human behavior related field
- Experience in applied statistics i.e. probabilistic models and Bayesian models, machine/deep learning, reinforcement learning and human-in-the-loop online learning

**Duration:** 4 months

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## Human-Machine Interaction

### Human Behavior Modeling (Job Number: P20INT-08)

This project focuses on behavioral model for social human machine interaction (interacting with regular or L2 automated vehicles). The project involves human behavior pattern recognition, development of behavioral model using probabilistic models. You are expected to:

- Define behavioral patterns and conduct recognition analysis
- Reasoning of causalities between human characteristics with specific behavioral patterns
- Build behavior modeling framework to understand and predict interactions between human and machine
- Develop more usable machine/deep learning tools for improve system performance and mobility safety

**Qualifications:**

- Highly qualified M.S. candidate in human behavior related field (human computer interaction, human factor engineering, cognitive science), psychology, or social science, statistics or operation/industrial engineering
- Familiarity with human-machine interface, interaction/behavioral modeling for automobiles
- Knowledge in multivariate statistical methodologies e.g. causal inference with observable data, longitudinal analysis, classification, dimension reduction, clustering, hierarchical linear (random effects) modeling
- Experience in machine learning algorithms

**Bonus Qualifications:**

- Ph.D. candidate in computer science, electrical engineering, mathematics, statistics, psychology, cognitive science or human behavior related field in Applied Statistics, Mathematics, Psychology, Cognitive Science and Human Computer Interaction
- Experience in applied statistics i.e. probabilistic models and Bayesian models, machine/deep learning.

**Duration:** 3 months

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### Integrations Engineer for Demonstrable Systems (Job Number: P20INT-09)

This project focuses on integrating multiple submodules for demonstration purposes; in particular, the demonstrations will showcase the benefits of situational awareness models for driver assistance systems. You are expected to:

- Evaluate existing components or systems to determine integration requirements
- Build an integrated, yet modular system to support swapping of submodules
- Support running a user study to demonstrate the built system

**Qualifications:**

- M.S. candidate in computer science and electrical engineering related field
- Experience in signal processing and human-computer interaction
- Excellent programming skills in multiple languages: C++, Python, Java, XML, etc.

**Duration:** 3–4 months

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### System Development for Next Generation Mobility Interfaces (Job Number: P20INT-10)

User studies are critical for creation and validation of futuristic interfaces for next-gen mobility solutions. To support these user studies, this position will focus on development and improvement of mobility solutions on our driving simulator using game engines. This is a part time intern position (2-3 days/week). You are expected to:

- Develop and improve driving environments on our driving simulator using game engines
- Integrate hardware and software for data collection
- Support collection of user study data using the driving simulator

**Qualifications:**

- M.S. or highly qualified B.S. in Computer Science, Computer Engineering, Game Development, or related fields
- Experience in game engines (e.g., Unreal Engine 4, Unity)
- Excellent programming skills in Python, C++, and/or C#

**Bonus Qualifications:**

- Experience in collecting human subject study data

**Duration:** 3 months

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### Computational Models for Human-Aware Systems (Job Number: P20INT-11)

Seamless interaction between human and automation requires the automation to be aware of human states and resultant behaviors. This position involves developing computational models of human state as well as optimizing automation behavior based on human state using supervised and reinforcement learning algorithms. You are expected to:

- Model dynamics of human behavior for human-automation interactions
- Develop modeling framework to understand and predict human cognitive states
- Create and validate tools to optimize system performance based on predicted human states

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, electrical engineering, mathematics, statistics, psychology, cognitive science or human behavior related field
- Research experience in behavioral research and human-computer interaction
- Excellent programming skills in Python and/or C++

**Bonus Qualifications:**

- Experience in applied statistics i.e. probabilistic models and Bayesian models, machine/deep learning, reinforcement learning, and human-in-the-loop online learning
- Experience in open-source deep learning frameworks such as TensorFlow or PyTorch preferred
- Experience with designing and conducting human subject study

**Duration:** 3 months

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### Vision and Language Navigation (Job Number: P20INT-12)

This project focuses on developing vision and language algorithms to advance research in vision-language navigation. The project involves developing algorithms that interpret visually-grounded natural language instructions and conduct driving/in-house navigation tasks based on the input text. You are expected to:

- Develop algorithms to advance research in vision-language navigation.
- Develop algorithms that interpret visually-grounded natural language instructions
- Conduct system navigation tasks based on the input text

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, electrical engineering, or related field
- Strong familiarity with computer vision, natural language processing and machine learning techniques pertaining to vision and language navigation
- Experience in open-source deep learning frameworks (TensorFlow or PyTorch)
- Excellent programming skills in Python

**Duration:** 3 months

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### Multimodal Signal Processing for Human State Estimation (Job Number: P20INT-13)

This project focusses on development of multi-modal machine learning algorithms for driver state estimation. The project involves recognition of driver state (such as workload, engagement, trust) sensing from car sensory, driver physiology, and driver behavior data. You are expected to:

- Develop multi-modal machine learning algorithm for metal state estimation for drivers using autonomous vehicles

- Develop an algorithm that estimates driver's workload, trust, and engagement state by fusing multi-modal sensor signals from car sensory, driver physiology (e.g., heart rate), eye tracking, and behavior (reaction to autonomous vehicle operation) data

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, electrical engineering, or related field
- Strong familiarity and experience in machine learning, data analytics and signal processing
- Experience in open-source deep learning frameworks (TensorFlow or PyTorch)
- Highly proficient in Python

**Bonus Qualifications:**

- Experience / interest in on-the-road social psychology preferred

**Duration:** 3 months

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## Computer Vision

### Human Activity Recognition and Forecasting (Job Number: P20INT-14)

This internship position will focus on developing computer vision and machine learning algorithms for recognition and forecasting human activities in an everyday environment. You are expected to work on:

- Activity recognition
- Activity forecasting
- Action localization
- Pose prediction
- Creation of a benchmark human behavior dataset for various applications

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, electrical engineering, or related field
- Strong research experience in computer vision, machine learning, robotics
- Experience in open-source deep learning frameworks such as TensorFlow or PyTorch

**Bonus Qualifications:**

- Hands-on experience in one or more of the following: graph neural networks, graph convolutional networks, probabilistic neural networks, deep generative models (GAN/VAE), reinforcement learning
- Publications in top-tier conferences (CVPR, ICCV, ECCV, ICML, NeurIPS, ICLR, ICRA, IROS, etc.)

**Duration:** 3 months

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### Human Behavior Understand and Prediction (Job Number: P20INT-15)

The title includes multiple positions, which focus on developing computer vision and machine learning algorithms for analysis, prediction, and understanding of human behavior in various domains to support ongoing research on next-generation intelligent mobility systems. You are expected to work on:

- Behavior reasoning
- Social interaction modeling
- Trajectory prediction
- Uncertainty estimation and quantification

- Relational inference
- Creation of a benchmark dataset for various applications

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, electrical engineering, or related field
- Strong research experience in computer vision, machine learning, robotics
- Experience in open-source deep learning frameworks such as TensorFlow or PyTorch

**Bonus Qualifications:**

- Hands-on experience in one or more of the following: graph neural networks, graph convolutional networks, probabilistic neural networks, deep generative models (GAN/VAE), reinforcement learning
- Publications in top-tier conferences (CVPR, ICCV, ECCV, ICML, NeurIPS, ICLR, ICRA, IROS, etc.)

**Duration:** 3 months

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### Anomaly Detection in Traffic Scenes (Job Number: P20INT-16)

This project focuses on developing unsupervised (or semi-supervised) computer vision and machine learning algorithms to detect rare or anomalous events in traffic scenes to support motion planning and decision making in advanced driver assistance systems. You are expected to:

- Create unsupervised (or semi-supervised) algorithms that can generalize to the long tail of unseen or uncommon traffic scenes from ego-centric visual inputs collected in driving scenes
- Develop and evaluate metrics to verify reliability of the proposed algorithms
- Contribute to a portfolio of patents, academic publications, and prototypes to demonstrate research value

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, electrical engineering, or related field
- Strong familiarity with computer vision and machine learning techniques pertaining to anomaly detection
- Experience in open-source deep learning frameworks such as TensorFlow or PyTorch preferred
- Excellent programming skills in Python or C++

**Bonus Qualifications:**

- Experience in unsupervised or self-supervised anomaly detection in traffic scenes

**Duration:** 3–6 months

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### Human Object Physical Interaction Detection (Job Number: P20INT-17)

The project focuses on research and development of computer vision and machine learning algorithms toward detection of human-object physical interactions from video. You are expected to:

- Develop algorithm for detection of contact events with objects and/or the environment from monocular and/or RGBD video inputs
- Support development of human-object interaction algorithm from video
- Support development of a benchmark dataset for evaluation of results
- Develop and evaluate metrics to verify reliability of the proposed algorithms
- Contribute to a portfolio of patents, academic publications, and prototypes to demonstrate research value

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, electrical engineering, or related field
- Strong research experience in computer vision and machine learning
- Hands-on experience in one or more of the following from video inputs: pose estimation, human object interaction detection, and human activity recognition
- Experience in open-source deep learning frameworks such as TensorFlow or PyTorch preferred
- Excellent programming skills in Python/C++/Matlab

**Bonus Qualifications:**

- Experience with contact event detection from video

**Duration:** 3–6 months

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### Video Captioning in Traffic Scenes (Job Number: P20INT-18)

This title includes multiple positions, which focus on developing computer vision and machine learning algorithms to generate linguistic descriptions of traffic scene events that are important for the development of advanced driver assistance systems. You are expected to:

- Generate natural language description of unstructured traffic scene events that impact navigation (e.g. accidents, construction, road blockage) from video inputs
- Participate in creating a dataset to support activities in video-based captioning of traffic scenes
- Develop and evaluate metrics to verify reliability of the proposed algorithms
- Contribute to a portfolio of patents, academic publications, and prototypes to demonstrate research value

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, electrical engineering, or related field
- Strong familiarity with computer vision and machine learning techniques pertaining to video captioning
- Experience in open-source deep learning frameworks such as TensorFlow or PyTorch preferred
- Excellent programming skills in Python or C++

**Bonus Qualifications:**

- Familiarity with creating datasets for video captioning, including visual question and answering methods is preferred for one position

**Duration:** 3–6 months

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### Visual Understanding of Traffic Scenes (Job Number: P20INT-19)

The title includes multiple positions, which focus on developing computer vision and machine learning algorithms to capture the detailed semantics of 2D and/or 3D traffic scenes. You are expected to work on one of the following topics:

- Capturing the semantics of visual scenes by explicit modeling of objects, their attributes, and relationships to other objects and the environment
- Higher-level classification/recognition of dynamic traffic scenes including place, conditions, and spatial relationships using temporal event detection, action recognition, and localization

- Detection and understanding of unstructured events that impact navigation, such as disabled vehicles, construction zones, traffic accidents, etc.

You are also expected to:

- Develop and evaluate metrics to verify reliability of the proposed algorithms
- Contribute to a portfolio of patents, academic publications, and prototypes to demonstrate research value

**Qualifications:**

- Ph.D. or highly qualified M.S. candidate in computer science, electrical engineering, or related field
- Strong familiarity with computer vision and machine learning techniques pertaining to scene understanding, image classification, and object detection
- Hands-on experience in one or more of the following: scene graphs, spatio-temporal graphs, graph neural networks, visual recognition, video classification
- Experience in open-source deep learning frameworks such as TensorFlow or PyTorch preferred
- Excellent programming skills in Python or C++

**Duration:** 3–6 months

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## Machine Learning/AI

### IRL and Control Research (Job Number: P20INT-20)

Understanding and modeling human behavior is essential for driving safely through crowded environments. This position investigates how inverse reinforcement learning (IRL) can be used to model the behavior of other agents. Focus will be placed on efficiently identifying and modeling a diverse set of driving styles. You are expected to:

- Implement state-of-the-art IRL and Model Predictive Control (MPC) algorithms
- Research and develop diverse behavior models conditioned on differences in human personality

**Qualifications:**

- MS or PhD candidate computer science, or related STEM field
- Strong familiarity and research experience in RL, IRL, and control of robotic systems
- Highly proficient in software engineering using C++ and/or Python

**Bonus Qualifications:**

- Experience with deep learning software like TensorFlow or PyTorch
- Familiarity with ROS
- Hands on experience with robotic control

**Duration:** 3+ months

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### Learning and Control Research (Job Number: P20INT-21)

Traditional control methods often depend on assumptions that limit their effectiveness in complex environments, while learning based methods often lack the robustness needed for real world deployment. This position investigates how state-of-the-art prediction methods can be combined with robust model predictive control algorithms to produce complex decision making on robotic systems. You are expected to:

- Implement state-of-the-art prediction and control algorithms on robotic systems

- Research and develop methods for generating and responding to dynamic behaviors

**Qualifications:**

- MS or PhD candidate systems engineering, computer science, or related STEM field
- Strong familiarity and research experience in deep learning and/or control of robotic systems
- Highly proficient in software engineering using C++ and/or Python

**Bonus Qualifications:**

- Experience with deep learning software like TensorFlow or PyTorch
- Familiarity with ROS
- Hands on experience with robotic control

**Duration:** 3+ months

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