2025 Summer internship recruitment theme

Mar-2025

① Research area (Information/Mathematics/Social Systems)

Toyota Central R&D Labs. Inc.

T:National Institute of Technology (KOSEN) student, B:Undergraduate student, M:Master's course student, D:Doctoral course student

Num.	Research theme	Research content	Basic knowledge required	Number of people recruiting		Work location	Target students			
				Date 8/18～29	Date 9/1～12		T	B	M	D
A1	Multihop communication evaluation using network simulator	Utilize a network simulator to evaluate the performance of multi-hop communication using vehicles and expand scenarios.	C/C++	1person		Tokyo	○	○	○	○
A2	Evaluation of V2X Application Effects in Urban Areas Using a Communication Simulator.	Using a communication simulator in an urban environment, evaluate the performance of V2X applications, radio wave propagation models, and computational load	C/C++		1person	Tokyo	○	○	○	
A3	Development of an Evaluation Model for the Circular Economy	This study aims to develop a part of the model that evaluates new indicators for the automotive industry (such as well-being, carbon neutral, and circular economy) and quantifies the impact of changes in mobility functions and manufacturing methods on these indicators. Based on a evaluation indicator model, we will work on constructing a calculation algorithm using generative AI.	Experience in programming with generative AI is preferred (Python will be used in this intern).		2person	Nagakute		○	○	○
A4	Infinite redirected walking	Implementation of mapping position information between real and virtual spaces	Python or C/C++	1person		Nagakute			○	
A5	Photon emission dynamics simulation	Using a simulator of a photon-atom system, we analyze photon emission phenomena and discuss their potential applications.	Python, research experience in quantum systems (if possible)	1person		Tokyo			○	○
A6	Comparison and Evaluation of Knowledge Graph Embeddings	Explore methods for embedding, visualizing, managing, and searching knowledge graphs, including urban data.	Python, PyTorch, and machine learning.		1person	Tokyo			○	○
A7	Simulation for wireless proagation in city area utilzing GPU	Implement a ray-tracing method for fast wireless propagation simulation.	C/C++		1person	Tokyo			○	○
A8	Interaction of multiple AI agents	Establish a simulation environment where multiple AI agents interact with each other.	Python, LLM	1person		Tokyo			○	○
A9	Theoretical study of nonlinear optical materials	We explore organic-inorganic hybrid materials with high hyperpolarizability using first-principles and quantum chemical calculations.	Able to perform first-principles or quantum chemistry calculations on Linux	1person		Nagakute			○	○
A10	Computational Design using PINNs	Perform optimal shape design of objects using Physics-Informed Neural Networks (PINNs) as a surrogate model.	Python and basic knowledge of machine learning.		1person	Nagakute			○	○
A11	Basic Study on Path Planning Using Reinforcement Learning	This topic conducts a fundamental study of a reinforcement learning-based approach for the Multi-Agent Path Finding (MAPF) problem.	Python	1person		Nagakute			○	○
A12	Object Grasping by a Robotic Arm Using Image and Haptic Force Sensing	We will equip a robotic arm with image and haptic force sensors and investigate and evaluate object grasping control using a recognition model based on deep learning.	Python		1person	Nagakute			○	○
A13	Integration of Machine Learning with Control and Optimization	Survey the latest studies on the integration of machine learning with control and optimization, and identify key challenges.	Machine learning, optimization, or control theory.	1person		Nagakute			○	○
A14	Study on solving mathmatical optimization problems with natural language descriptions	Trial on the formulation and the code-implementation of mathematical optimisation problems using large language models.	Python Object-oriented programming		1person	Nagakute			○	○
A15	Development of an Algorithm for Estimating a Physical Property of Stirred Liquid	developing an algorithm to estimate a physical property of stirred liquid by combining mathematical models and machine learning	Continuum Mechanics/Machine learning	1person		Nagakute			○	○
A16	Initialization Methods for Structured Matrices	Explore initialization methods for neural networks including structured matrices.	Python, PyTorch, machine learning		1person	Nagakute			○	○
A17	Prototyping of an AI Agent for Design	Prototyping and evaluation of an autonomous AI agent generating designs from designers' instruction.	Python, LLM	1person		Nagakute			○	○
A18	Prototyping of a Life Assistance AI Agent	Prototype and evaluate an AI agent that operates in indoor environments by interfacing with IoT devices.	Python		1person	Nagakute			○	○
A19	Reconstruction of urban models from 360-degree video data with GPS data	Generation of 3D models by associating camera images with PLATEAU data.	C++/Python	1person		Nagakute			○	○
A20	Image Segmentation of Scanning Electron Microscope Images for Microstructural Analysis	We will investigate and evaluate an image segmentation method using few-shot learning for electron microscope images of component material surfaces.	Python(pytourch)		1person	Nagakute			○	○
A21	Survey Analysis on Travel Behavior	Analyze a nationwide survey on the usage and satisfaction of transportation modes to identify factors influencing perceived accessibility.	basic knowledge of statistics	1person		Nagakute			○	○
A22	Potential assessment for introducing electric vehicles	Using mobility, architecture, and urban spatial data, we will assess the potential for introducing electric vehicles from the perspective of urban development towards a carbon-neutral society.	basic knowledge of statistics		1person	Nagakute			○	○
A23	Impact assessment of critical mineral price spikes on battery electric vehicle penetration	We will assess the impact of critical mineral price spikes, battery reuse and recyling on battery electric vehicle penetration by mathematical technology choice model.	basic knowledge of statistics	1person		Nagakute			○	○

2025 Summer internship recruitment theme

② Research area（Materials)

Mar-2025

Toyota Central R&D Labs. Inc.

T:National Institute of Technology (KOSEN) student, B:Undergraduate student, M:Master's course student, D:Doctoral course student

Num.	Research theme	Research content	Basic knowledge required	Number of people recruiting		Work location	Target students			
				Date 8/18～29	Date 9/1～12		T	B	M	D
B1	Quality prediction of objects fabricated via laser powder bed fusion (L-PBF) process	The intern will participate in the project of which is to study the impacts of the process conditions on the quality of the samples fabricated via L-PBF proces.	metallic materials and processes		1person	Nagakute	○	○	○	○
B2	Deposition of dissimilar materials by directed energy deposition(DED)	To investigate the relationship between process conditions and fabrication quality (shape accuracy, adhesion of dissimilar interfaces, etc.) with the aim of constructing a technology for depositing dissimilar materials using DED.	metallic materials and processes	1person		Nagakute	○	○	○	○
B3	Research on Predictive Detection Technology for Material Degradation	Investigation of methods for detecting environment-induced cracking in materials.	Materials Engineering	1person		Nagakute	○	○	○	○
B4	Impact fracture characteristics of samples fabricated via laser powder bed fusion process	The intern will measure impact fracture characteristics of the samples fabricated via L-PBF and investigate the effects of process parameters.	skills to evaluate mechanical properties, metallurgy	1person		Nagakute	○	○	○	
B5	Analysis of volatile components in resin	Exploring sample concentration and analytical techniques in gas chromatography/mass spectrometry	Analytical Chemistry		1person	Nagakute	○			
B6	Study of an application of liquid phase diffusion bonding (TLP) method towared for higher performance motors	Fabricabrication of specimens bonded between nanomagnetic material and electromagnetic steel sheet using transsient liquid phase (TLP) method and investigation of the influence of the liquid phase diffusion bonding layer on the magnetic and mechanical properties.	Materials Science and Engineering, Metallic materials		1person	Nagakute		○	○	○
B7	Study on soft magnetic composite cores using magnetic metal nanoparticles	Fabrication of composite cores using magnetic metal nanoparticles by low-pressure powder compaction, and evaluation of their magnetic and structural properties.	Materials Science and Engineering	1person		Nagakute		○	○	○
B8	Study on microstractural changes of cast steel by thermo-mechanical treatment .1	Investigantion of microstructural changes in cast steel during cold working and heat treatment	metallography, structure observation	1person		Nagakute			○	○
B9	Study on microstractural changes of cast steel by thermo-mechanical treatment .2	Research on analysis of working strain using CAE and the structural changes by heat treatment.	metallography, CAE		1person	Nagakute			○	○
B10	Construction of an automatic and autonomous experimental system for powder/slurry materials	The objective is to build equipment and systems for automatic and autonomous experiments leading to "process informatics". The project will examine preliminary experiments for device implementation and work on the construction of an automated system using robots.	Nothing in particular	1person	1person	Nagakute			○	○
B11	Analysis of rheological behavior and microstructure of electrode slurries for lithium ion batteries	Characterization of flow behavior and microstructure of model electrode slurries by rheological method	Chemical experiments or computational technology	1person	1person	Nagakute			○	○
B12	Analysis of material surfaces using analytical instruments	Surface characterization of semiconductors, catalysts, batteries, or sliding parts using X-rays	Chemistry, Solid State Physics, Experimental Basics	1person		Nagakute			○	○
B13	Research on joining dissimilar metal materials	Study on interface and joining strength of Cu-x dissimilar materials.	metallography, joining		1person	Nagakute			○	○
B14	Upgrading recycling of aluminum	Removal of dissolved impurities in aluminum alloy scrap using thermodynamic approach	Thermodynamics	1person		Nagakute			○	○
B15	Analysis of recycled resin and lightweight materials	Various spectroscopic analyses to elucidate recycling processes and adhesion mechanisms	Chemistry experiments		2person	Nagakute			○	○
B16	Synthesis and evaluation of physical properties of novel recyclable polymers	Synthesize recyclable polymers by decomposition under specific conditions, and evaluate their mechanical properties.	Organic chemistry	1person		Nagakute			○	○
B17	Fabrication and evaluation of recyclable (co)polymers	Polyaddition of telechelic polymers, and evaluation of their thermal properties and recyclabilities.	Polymer chemistry, Polymer physics		1person	Nagakute			○	○
B18	Finite element analysis of metamaterial	This study investigates the relationship between stress and strain of bistable lattice structures through compression simulation.	Computational mechanics	1person		Nagakute			○	○
B19	Fabrication and electrochemical characterization for advanced lithium-ion batteries	You will fabricate small-sized lithium-ion batteries and evaluate their capacity, resistance, and durability yourself.	Electrochemistry		1person	Nagakute			○	○
B20	Investigation of physical modelling for powder of electrodes	Examine conversion real process of battery electrodes/material into physical model/powder properties	Statistical Mechanics or Fluid Mechanics	1person	1person	Nagakute			○	○
B21	Synthesis and evaluation of functional materials for organic-inorganic composite	Synthesis of ceramic materials, Electrical evaluation, Microstructural observations, etc.	Ceramic processing, Electrical properties		1person	Nagakute			○	○

2025 Summer internship recruitment theme

Mar-2025

③ Research area (Energy, Environments, Mechanical engineering)

Toyota Central R&D Labs. Inc.

T:National Institute of Technology (KOSEN) student, B:Undergraduate student, M:Master's course student, D:Doctoral course student

Num.	Research theme	Research content	Basic knowledge required	Number of people recruiting		Work location	Target students			
				Date 8/18～29	Date 9/1～12		T	B	M	D
C1	Digital twin for deformation behavior estimation in press forming	Data collecting with press forming simulation and Python coding for deformation behavior estimation by data assimilation	Programming (Python) experience	1person		Nagakute	○	○	○	○
C2	Construction of automatic testing system for the development of visual inspection equipment	Develop a control program for an industrial camera, a robotic arm, and an automated stage. Construct an experimental setup that automatically captures workpiece images under different imaging conditions.	Python	1person		Nagakute	○	○		
C3	Basic design and production for manufacturing	Machine parts design using CAD/CAE, processing and assembly using machine tools, and functional confirmation of prototypes	Machine design, Machining	1person	1person	Nagakute	○	○		
C4	Estimation of pressure in engine intake and exhaust system using modeling method based on machine learning	We will verify the effectiveness of considering the heat transfer between the gas and the wall surface based on the law of conservation of energy for the estimation model of pressure in engine intake and exhaust system.	fluid mechanics, thermodynamics, machine learning, MATLAB	1person		Nagakute			○	○
C5	Investigation of engine combustion models for carbon neutral fuels	CFD combustion models that can predict the combustion of carbon neutral fuels are evaluated	thermodynamics, fluid dynamics	1person		Nagakute			○	○
C6	Development of numerical simulation model for the chemical reactions of matal-oxide particles	Develop a simulation model to analyze the effect of the surface state of metal-oxide particles on chemical reaction rates	Chemical Engineering		1person	Nagakute			○	○
C7	Evaluation of hydrogen storage alloys using machine learning potentials	Evaluate the performance of hydrogen storage alloys using machine learning potentials and explore approaches to improve their performance	Python	1person		Nagakute			○	○
C8	Research for CO2 hydrogenation catalysts	Syntheisis and catalytic activity evaluation of CO2 hydrogenation catalysts	Catalyst synthesis and evaluation		1person	Nagakute			○	○
C9	Photoelectrochemical CO2 conversion	Fabrication of photocatalytic electrodes and evaluation of photoelectrochemical CO2 reduction	Photochemistry, Electrochemistry		1person	Nagakute			○	○
C10	Tribology (friction, wear, lubrication) research aiming for zero-wear in mechanical systems	Making new lubricant oils aimed zero-wear, evaluation of those properties, observation and analysis of sliding surfacies.	Either chemical engineering, organic or polymer chemistry or tribology	1person	1person	Nagakute			○	○

2025 Summer internship recruitment theme

Mar-2025

④ Research area (Electronics, Biotechonology, Human and Life sciences)

Toyota Central R&D Labs. Inc.

T:National Institute of Technology (KOSEN) student, B:Undergraduate student, M:Master's course student, D:Doctoral course student

Num.	Research theme	Research content	Basic knowledge required	Number of people recruiting		Work location	Target students			
				Date 8/18～29	Date 9/1～12		T	B	M	D
D1	Microwave resonators for quamtum sensing	Design of a microwave resonator for quantum sensing using an electromagnetic simulator	Electromagnetics		1person	Nagakute	○	○	○	○
D2	Evaluation of Optical Sensing Devices and Systems.	Signal processing and performance evaluation of optical sensing devices and systems.	Programming (signal processing)		1person	Nagakute	○	○	○	○
D3	Evaluation of the Properties of Magnetic Materials Used in Motor Materials	In the practical training, we will evaluate the magnetic properties of electrical steel sheets under applied stress and analyze various factors.	magnetic engineering	1person		Nagakute	○	○	○	
D4	Digital twin modeling of semiconductor manufacturing process	Development of a semiconductor manufacturing process model using various data obtained from the processes, with a focus on understanding the physics involved in the processes.	Programming (Python) experience		1person	Nagakute	○	○	○	
D5	Building an Object Detection and Robot Control Platform Using Image Recognition	Design, implement, and evaluate an object catching system combining image recognition and robotics using Raspberry Pi	programming	1person	1person	Nagakute	○	○		
D6	Evaluation and analysis of human fatigue sensing technology	Basic studies of human fatigue sensing by bio-impedance mesurements.	Biomedical engineering、electromagnetics、electronic circuits	1person		Nagakute		○	○	○
D7	Fabrication and analysis of thin films for semiconductor sensors	Basic studies of semiconductor or metal thin films prepared by sputter method.	Semiconductor engineering, processing, inorganic materials		1person	Nagakute		○	○	○
D8	High-precision 3-Axis Gyroscope	Dynamic/static performance evaluation of the 3-axis gyroscope for expecting automotive use	Control, Mechanical engineering, Electronics	1person		Nagakute		○	○	
D9	Evaluation of Sensor Characteristics Using Electromagnetic Fields	We will conduct practical training to detect people and objects using electromagnetic fields and infer their states.	Electrical/Electronic Engineering	1person		Nagakute			○	
D10	Sensitivity improvement of SiC-based quantum sensors	Fabrication and evaluation of SiC color centers	Fundamental mechanism of quantum sensors		1person	Nagakute			○	○
D11	Photon pair generation from nanostrucutred nonlinear optical materials	Optical measurement of nanostructured photonic devices	At least one of the following experience or knowlede: Optical Measurement, Python, quantum optics	1person		Nagakute			○	○
D12	Design of a New Motor Structure Utilizing Topology Optimization	In the practical training, we will derive and verify shapes that improve motor characteristics using topology optimization methods.	electromagnetic field analysis		1person	Nagakute			○	○
D13	Crystal growth of GaN by vapor-phase growth method	Investigatition of crystal growth of GaN using CVD equipment	Crystal growth, Structural analysis	1person		Nagakute			○	○
D14	Research on Olfactory Perception and EEG	Measurement and analysis of EEG while sniffing fragrances.	Programing experiences with Matlab or Python.		1person	Nagakute			○	○
D15	Study on molecular breeding and high-speed screening of microorganisms.	Examination of effective screening technology for rcombinant microorganisms.	Life sciences, Biotechnology		1person	Nagakute			○	○
D16	Biodiversity monitoring using environmetal DNA	Environmental DNA analysis for biodiversity	Bioinformatics, Life Science	1person	1person	Nagakute			○	○
D17	Modeling of approach-avoidance behavior	Investigation of decision making methods associated with physiological measurements	Programming skill using Python/Basic knowledge of brain	1person		Nagakute			○	○