

2023 年度

インペリアル カレッジ ロンドン研究プログラム

International Research Opportunity Program(IROP)募集要項

本学の協定校であるインペリアル カレッジ ロンドン（以下、ICL）が募集する研究プログラムに参加する学生に対し、奨学金、手続き支援及び単位付与による支援を行う。

本学と派遣先大学の選考に合格した場合でも、新型コロナウイルスの感染拡大や新たな変異株の出現などにより、直前で海外渡航できなくなる場合がある。また、渡航後であっても、感染状況によっては本学の判断で途中帰国を指示することがある。いずれの場合も、航空券、宿泊、参加費などのキャンセル料については自己負担となる。

以下の外務省ウェブサイトで渡航先の危険情報と、日本からの渡航者に対する各国・地域の入国制限措置及び入国・入域後の行動制限が記載されているので、必ず確認すること。

<https://www.anzen.mofa.go.jp/>

https://www.anzen.mofa.go.jp/covid19/pdfhistory_world.html

本プログラム参加にあたっては、かならず家族・保証人及び指導教員に相談し、同意を得ること。

記

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| <u>1. 概要</u> | ICL の研究室に 8 週間滞在し、受入教員のもとで研究プロジェクトを行う。
なお航空券の手配や、渡航手続きは、応募者（参加者）が責任を持って行う必要がある。 |
| <u>2. 費用・奨学金</u> | 1) 費用
研究費は無料。住居費、航空券代、海外旅行保険料、その他現地滞在費は自己負担。
2) 奨学金
独立行政法人日本学生支援機構（JASSO）または東工大基金よりプログラム中 31 日ごとに 10 万円を支給。ただし、渡航・移動日はカウントされない。 |
| <u>3. プログラム期間</u> | 2023 年 7 月 3 日～8 月 25 日 |
| <u>4. 募集人数</u> | 4 名 |
| <u>5. 対象プログラム</u> | 詳細は、International Research Opportunities Programme 2022-23
Research project description for Tokyo Tech students を確認すること。 |

6. 応募資格

- 1) 学士課程（プログラム開始時に3年生以上）または修士課程学生。¹
- 2) 留学期間終了後、本学に戻り学業を継続する者、または本学の学位を取得する者
- 3) その他、プログラムの要求する学年・所属・専門分野等の条件をみたす者
詳しくは、International Research Opportunities Programme 2022-23 Research project description for Tokyo Tech students を参照。
- 4) CEFR B2以上の英語力を（TOEIC785点、TOEFL ITP543点、TOEFL iBT72点）を有すること。必要に応じて面接で英語能力を確認される場合がある。
- 5) 成績証明書（東工大以外の大学を卒業した修士課程1年生等、東工大での前年度の成績がない者のみ。以前の所属先の最終年度成績書を提出すること。）

※1 外国人留学生の出身国への留学は原則として認めない。また、国費留学生は募集対象外。

7. 応募方法

参加には本学の推薦が必要。応募者多数の場合は書類選考、および面接を行う場合がある。

留学生交流課への応募：

以下のURLから申請書をダウンロードし、応募書類は1つのPDFファイルにすること。

<https://www.titech.ac.jp/students/abroad/programs/irop>

応募書類アップロード用URL：

<https://tokyotech.app.box.com/f/e4992c77614e4d8799e278e346f14e4e>

8. 提出期限

留学生交流課への応募締切：2022年12月23日正午（日本時間）

応募にあたっては、指導教員またはアカデミックアドバイザーによる承認（申請書への署名・押印）が必要。余裕を持って準備すること。外国人留学生の場合は、渡航先のビザ取得期間、条件等を事前に確認すること。

上記提出期限において書類不備、もしくは応募締切を過ぎての応募は受理しない。

9. 提出先及び問い合わせ先

留学生交流課（Taki Plaza 地下1階、学内便 TP-003）

メール：intl.sgu@jim.titech.ac.jp、電話：03-5734-3433

オフィスアワー：9:00～12:15, 13:15～17:00

10. 学内選考

書類選考、面接

11. その他

- 1) 参加決定後、提出書類と手続きについて説明するオリエンテーションを開催するので必ず参加すること。
- 2) 大学の指定する海外旅行保険（危機管理サービス込）に必ず加入すること。
- 3) 参加後、留学生交流課から依頼があれば、留学イベントでの発表や留学広報、留学の成果に関する各種アンケートや調査に極力協力すること。
- 4) 帰国後、報告書（学士課程学生は日本語、修士課程学生は英語にて作成）等の必要書類を留学生交流課に提出。
- 5) 単位付与を希望する場合は、留学生交流課に申し出ること。

International Research Opportunities Programme 2022-23

Research project description for Tokyo Tech students

Supervisor	Dr Prasun Ray https://www.imperial.ac.uk/people/p.ray
Department	Mathematics
Project title	Analysing global climate networks
Project description	<p>This project will work with historical global weather data. The datasets will be analysed and processed to construct networks where nodes represent geographical regions and links are placed between two nodes when the data for two regions is strongly correlated. Then, tools from network science and data science related to community detection and clustering will be applied to the networks to generate insight into how the global climate has evolved over recent decades.</p> <p>This will be a group project including students from Imperial.</p>
Skills and experience required	<p>Tokyo Tech can potentially send 3rd and 4th year undergraduate and master level students (please specify any preference):</p> <p>Experience with Python programming, and either data science or network science would be very helpful.</p>
Number of students the project could host	1-2

International Research Opportunities Programme 2022-23

Research project description for Tokyo Tech students

Supervisor	Professor Kevin Buzzard - Home - Professor Kevin Buzzard (imperial.ac.uk)
Department	Mathematics
Project title	Formalising algebraic geometry
Project description	This project is about teaching algebraic geometry to a computer proof assistant. Algebraic geometry is a vast subject area, and there are plenty of results in it which have never been taught to a computer before, ranging from the straightforward to the difficult. I am involved in a project teaching algebraic geometry to the Lean theorem prover and there are plenty of things which are accessible to undergraduates.
Skills and experience required	Any mathematics or Maths + Computing student would be fine. Ideally they would have played the “natural number game” first - https://www.ma.imperial.ac.uk/~buzzard/xena/natural_number_game/
Number of students the project could host	1-2 or more

International Research Opportunities Programme 2022-23

Research project description for Tokyo Tech students

Supervisor	Professor Colin Cotter https://www.imperial.ac.uk/people/colin.cotter
Department	Mathematics
Project title	Computational modelling of paper models
Project description	When paper is deformed, it must be modelled as a special type of elastic deformation that does not allow the material to be stretched – it must just be curved out of the plane. This is an example of an isometric material, which also has applications in robotics, nanotechnology and architecture. In this project we will build a computational tool that predicts the shape that will emerge when several pieces of paper are glued together in different ways, to make models such as those on https://curvahedra.com . This will involve developing an implementation of a finite element approximation using a Python-based library called Firedrake (firedrake-project.org).
Skills and experience required	Students should have knowledge of multivariate calculus. Students should have an interest in numerical modelling of partial differential equations and their iterative solution on a computer, and an enthusiasm for implementing mathematical algorithms as code.
Number of students the project could host	1

International Research Opportunities Programme 2022-23

Research project description for Tokyo Tech students

Supervisor	Dr Elena Dieckmann & Professor Robert Shorten Home - Dr Elena Dieckmann (imperial.ac.uk) Robert Shorten
Department	Dyson School of Design Engineering
Project title	KUPcrush!
Project description	<p>This project involves developing a circular economy using DLT and reverse vending machines. There is a trial going on at Dyson School of Design Engineering to take back coffee cups and creating a token system (IOTA) to manage material flows. This project could address different research topics, such as research on user behaviour, UX design for the reverse vending machines and coding for App design/ IOTA integration. The project will utilise the output of the MEng Master Project Students who finish their projects in July 2023. The student will work in collaboration with a PhD in the Labs at Imperial. They will be integrated in the I3 – Lab and research activities concerning circular economy, enabled by DLT.</p>
Skills and experience required	<ul style="list-style-type: none"> - 4th-year students only - Advanced English Skills - Mechanical Engineering - Electrical Engineering - Coding in Python - Raspberry PI - Data Science
Number of students the project could host	2-3

International Research Opportunities Programme 2022-23

Research project description for Tokyo Tech students

Supervisor	Dr Elena Dieckmann Home - Dr Elena Dieckmann (imperial.ac.uk)
Department	Dyson School of Design Engineering
Project title	Augmented Biomaterials & Circular Textiles
Project description	This project involves supporting the development of advanced manufacturing processes using custom build sensors and software for biomaterial production. The project will utilise the output of the MEng Master Project Students who finish their projects in July 2023. The student will work in collaboration with a PhD in the Labs at Imperial.
Skills and experience required	<ul style="list-style-type: none">- 4th-year students only- Advanced English Skills- Mechanical Engineering- IoT- Coding in Python- Raspberry PI- Data Science
Number of students the project could host	1-2

International Research Opportunities Programme 2022-23

Research project description for Tokyo Tech students

Supervisor	Dr Lorenzo Picinali https://www.imperial.ac.uk/people/l.picinali
Department	Dyson School of Design Engineering
Project title	3D audio processing through Generative Adversarial Networks (GANs)
Project description	<p>A Head-Related Transfer Function (HRTF) describes how a sound wave coming from a source is modified before reaching the entrance of the left and right ear canals of a given listener. HRTFs are used in many areas and applications, from the creation of immersive audio content to the development of novel hearing aid technologies.</p> <p>Considering that this filter differs depending on the relative position and orientation between the source and the listener, an HRTF Set is a group of HRTFs corresponding to several source positions sampled (possibly uniformly) at a given distance (distance-dependency of HRTFs is not object of the proposed project) around the listener. Considering that the morphological features of the external ear (e.g. pinna) and other relevant body parts (e.g. head and torso) contributing to the HRTF filtering are different between different individuals, HRTF Sets should be measured for every single person. The process for doing that is rather costly and time consuming, therefore generalised HRTFs, other types of estimation methods, are often used, resulting in a decrease efficacy (e.g. perceived realism, cues for auditory scene analysis, etc.) of the filter.</p> <p>One way to approach this problem is to measure HRTF Set using a small number of positions, and to then derive the HRTFs for the missing positions using interpolation techniques. Generative Adversarial Networks (GANs) can be used to perform this task, with the potential of giving more accurate and effective results if compared with traditional interpolation methods.</p> <p>The proposed project aims at exploring the use of GANs for the interpolation between HRTFs in sparse-sampling conditions, looking at the problem for individual subjects, and at the possibility of applying transfer learning in order to generalise the problem to other HRTF Sets.</p> <p>This project has already involved three MSc students in the past years, and the work resulted in a journal publication: https://www.frontiersin.org/articles/10.3389/frsip.2022.904398/full#supplementarymaterial. Several challenges are though still open, and we are looking for other students to tackle them!</p>
Skills and experience required	<p>The preference would be for 4th year students. The required skills are:</p> <ul style="list-style-type: none"> • Comfortable with Python programming • Good understanding of statistical analysis (descriptive and inferential) • Already had an introduction to machine learning <p>The desirable skills are:</p> <ul style="list-style-type: none"> • Comfortable with Matlab programming

	<ul style="list-style-type: none">• Experience with using Python machine learning tools and libraries (e.g. PyTorch)• Past experience with audio technologies and digital signal processing.
Number of students the project could host	2