Division of Electrical Engineering and Computer Science	Research field	Basic Mathematical Science	Lab. ID
			EC32
Laboratory web site			

Research subjects

Complex analysis is often called function theory, since this theory is to study many aspects of complex functions and to classify them according to the results. In particular, such a function of a single variable attains each value at a certain sequence of complex numbers without limits in the complex plane. In general, infinite sequences correspond to those of the so-called transcendental function appearing in many fields. But a sequence of finite number or of smaller cardinality may be possible for some exceptional functions. One can classify the transcendental functions according to the order of growth of those sequences and apply the results for the study of the possible solutions of functional equations such as differential or difference equations. This theory was established by Rolf Nevanlinna about 90 years ago and is known as Nevanlinna theory or value distribution theory. Although this theory is now quite classical, it is not only still actively applied in many subjects in complex analysis but also several important analogues of the theory have been found in a field of the theory of probability or Diophantine approximations. It is a trend of studies in this area to find a 'dictionary' for these concepts. The main project in this laboratory is to find a Nevanlinna-like theory for real-valued, piecewise-linear and continuous functions defined on the real line. This is based on the fact that one can ultra-discretize complex analytic functions into those real functions. For about 20 years we have continue a joint research with a study group of the university of Eastern Finland located in a city where Nevanlinna was born. The latest research project is on track and proceeds to the stage for the further applications and extensions of our own results in the tropical value distribution theory.

Master/Doctor course: Education policy, curriculum, typical activity in the laboratory

Master course students have to both take some regular courses and attend a seminar on mathematical science for the purpose of the applications in engineering. Reading some texts written mainly in English, you will give a research presentation of the subjects that you have prepared with those texts at the seminar every week. Then we will make a discussion on your presentation together.

In April, every M2 student will have an interview with the supervisor and share your desire of the subjects that you wish to study for the master thesis and what to do after graduation and so forth. According to the result of this interview, we will determine the theme of your study for your thesis and the schedule for your study as well as all the activities for it.

Doctor course students will proceed your study of latest results and publications in the related fields by keeping close and steady contact with your supervisor. The both of us will examine as many as possible methods for those researches by applying to a variety of concrete examples. After these discussions and activities, we will try to solve open problems, prove some theorems or propose a new useful theory.

Daily life in the laboratory, etc.

This laboratory aims to study mathematical topics based on theoretical reasoning, so that there is no restriction or designation of sites and times for your study. You need to keep an well-ordered life and try to be deep in your research theme in order to find as much as opportunities for your considerations and attempts for possible ideas, methods in assistance of computer simulations, for example. You should keep in mind that your learning time or effort can never guarantee your results, while without them you cannot get anything in your study. You are expected to be in close contact with your research subjects anytime as a part of your life. You cannot do your study as a side business or by relying on others, that is my advise as your supervisor.

Message or comments by the laboratory faculty staffs

The research subjects for master course students will be found as mathematical problems that you found in your usual life or information by books, newspapers, TV or internet. You are supposed to respond sensitively to developments of information technology and related matters and to keep an attempt for a discovery of needs in your daily life. Doctor course students will be treated as an independent researcher. As your supervisor, I myself will of course try to set a good example of researchers for you all. Also I will provide you anything that I have got about my research so that you will be able to select what is useful or necessary fro you. Last but not least, You will be also supported in order to determine your course after your defence.

Recent Master theses in these 3 years (+ more if appropriate)

year.month	Thesis title (including English translation of Japanese thesis title)
2021.3	Evaluation of CapsuleGAN to generate Adversarial Example
2019.3	Deep Learning Model Compression by using GAN
2017.3	A study on effects of anxiety and emotion to the logical thinking and a consideration for the improvement of learning effects
2016.3	Study on hybridization of some Swarm Intelligence algorithms
2013.3	Study on the efficiency of vaccination by using an infection model on lattice.

2013.3	Study on the intervention for an infection model by means of percolation on a complex network.
Recent Doctoral theses in these 3 years (+ more if appropriate)	
year.month	Thesis title (including English translation of Japanese thesis title)
Laboratory mail address	Kazuya Tohge <tohge *at* se.kanazawa-u.ac.jp>