

REQUESTS FOR INDEPENDENT STUDY
Duke University – Department of Statistical Science
Trinity College of Arts & Sciences

Independent study enables a student to pursue for course credit individual interests under the supervision of a faculty member. Independent study is of two types: Independent Study (non-research) and Research Independent Study.

STA 393: Courses entitled Independent Study are individual non-research directed study in a field of special interest on a previously approved topic taken under the supervision of a faculty member and resulting in an academic and/or artistic product. Such independent study courses do not bear a Research (R) code and do not satisfy any general education requirements.

STA 493: Courses entitled Research Independent Study are individual research in a field of special interest under the supervision of a faculty member, the central goal of which is a substantive paper or written report containing significant analysis and interpretation of a previously approved topic. Such research independent study courses bear a Research (R) code and satisfy general education Research requirements. One research independent study may be submitted and approved for a Writing (W) code in addition to the R code designation, but no other curriculum code designations are permitted for research independent study courses. Students who wish to request a W code for one research independent study course must take the appropriate form to 02 Allen Building by the end of the semester they are enrolled in the course. The request form is available at <http://trinity.duke.edu/academicrequirements?p=independent-study-research-w-coding>.

Policies:

The following policies apply to both types of independent study:

1. **Approval** — The independent study must be approved by the instructor(s) involved as well as by the Director of Undergraduate Studies.
2. **Faculty appointment** — The instructor of record (supervising faculty member) must hold a regular rank faculty appointment at Duke within the Department of Statistical Science. Students can be co-advised by a faculty member outside of the Department. In some cases, there may be an additional instructor who mentors the bulk of the independent study and holds an appointment outside the sponsoring department or program. If this is the case, the supervising faculty member is responsible for submitting the final grade, and ensuring that the instructor adheres to academic standards, policies, and procedures pertaining to undergraduate students in Trinity College of Arts & Sciences.
3. **Course Content / Quality** — The independent study must provide a rigorous academic experience equivalent to that of any other undergraduate Duke course. Independent study courses may not duplicate available course offerings in the semester or summer term in which the independent study is being taken, nor may independent study be used simply to provide low-level support for other projects or to observe or shadow the work of others.
4. **Meeting schedule** — In addition to the individual effort of the student, which normally entails ~10 hours per week, the student will meet with the instructor of the independent study at least once a week.
5. **Final product** — The student will produce a final academic product to be completed during the semester for which the student is registered for the course. The final product must be submitted with the Director of Undergraduate Studies as a record of the independent study work completed.
6. **Grading** — The instructor will evaluate the work, including the final product, associated with the independent study, and submit a grade by the end of the semester.

Procedures:

1. Students wishing to register for an independent study or research independent study must first make arrangements with a faculty member having expertise in the desired area. The student and instructor should agree on the course title, plan of study, objectives and expectations, as well as on the nature of the final product and evaluation criteria.
2. The student submits the Independent Study Permission Form (attached here) to the Director of Undergraduate Studies for final approval before the end of the drop/add period of the term in which the independent study is to be taken. If approved, the student will receive a permission number to register for the course.

INDEPENDENT STUDY PERMISSION FORM
Duke University – Department of Statistical Science
Trinity College of Arts & Sciences

To the student: Please read the attached policies and procedures, and consult with your instructor / supervising faculty member about course title, description, requirements and expectations. This form must be approved and signed by the supervising faculty member, the instructor (if different from supervising faculty member), and submitted to the Director of Undergraduate Studies or Certificate Program Director before the end of the drop/ add period.

Date: 1/13/19

Student Name: Samuel Eure

Email: sfe2@duke.edu

Net ID: sfe2

Student ID (not unique ID): 2214951

Graduation Term and Year: Spring 2019

Major(s)/Minor(s)/Certificate(s): Mathematics (B.S.)/Statistical Sciences (minor)

Course Subject / Number: STA393

Term and Year: Spring 2019

Title: Deep Learning

Short Title (max 30 characters): Deep Learning: Theory & Use

Supervising Faculty Name: Dr. David Banks

Academic Title: Professor of the Practice of Statistics

Affiliation: Statistical Science

Instructor (if different from Supervising Faculty) Name: Not different.

Academic Title:

Affiliation:

Please provide the following information:

1. Title and description of proposed study

Provide a one to two paragraph description of the proposed study, including topic, course goals, research / readings to be conducted, and a rationale for independent study as opposed to regular course work.

Duke's course offerings in Machine Learning are growing but there currently is not a course tailored to Neural Networks and Deep Learning specifically. This independent study will aim provide a deep dive into the broad range of categories encapsulated by Deep Learning. These categories include but are not limited to: Recursive Neural Networks (RNNs), Convolutional Neural Networks (CNNs), Transfer Learning, Deep Reinforcement Learning, and Optimization theory as applied to neural networks (for example applying Dropout and Adam optimization).

We will cover each of the above topics giving ~3 weeks to each. During this ~3 week period we will be reading through the relevant section of the book Deep Learning (<https://www.deeplearningbook.org/>) before reading and discussing a few of seminal papers in the topic and then implementing the algorithm on either the MNIST (<http://yann.lecun.com/exdb/mnist/>) or ImageNet (<http://www.image-net.org/>) datasets.

2. Nature of the final product

Describe the nature and length of the final product (e.g., academic paper, artistic product, research report, etc.)

The final deliverable will be a Duke GitLab repository containing all algorithms implemented by myself throughout the semester with Markdown annotations describing the nature of the algorithm and the results/ performance of the code. An additional document comparing and contrasting the performance of these various algorithms may also be included.

3. Scheduled meetings and work expectations

Provide information on frequency and length of meetings with instructor, and expected work commitments and/or timetables:

Meetings with Dr. Banks will occur each week for 1 hour. There will be at least 10 hours of reading papers and implementing the various algorithms each week.

4. Grade to be based on

Provide information on how your work in the course is to be evaluated. Please be explicit.

A range - Weekly progress met or exceeded expectations, student is able to independently implement and justify methods, the end product is functional and meets expectations, and an accompanying write up describing the methodology is produced.

B range - Weekly progress did not always meet expectations, student's understanding of the methodology and implementation is not quite where it needs to be for successful completion of the project, a sub-par final product / write up is produced.

C range or lower - Weekly progress often did not meet expectations and/or student missed many meetings, student does not have a good handle on the methodology and is not able to implement it, a poor final product / write up is produced.

5. Reading list

For a regular independent study, provide a list of texts that will be studied over the course of the semester. For a research independent study, provide a bibliography of secondary sources related to your research proposal.

Specific papers for each topic will be decided upon during the start of that topic after a discussion with Dr. Banks about the literature and the relevant Deep Learning book section has provided some grounding.

The main textbook we will use is Deep Learning <https://www.deeplearningbook.org/> by Ian Goodfellow and Yoshua Bengio and Aaron Courville.

Many of the papers we read will come from this helpfully compiled site: <https://github.com/floodsung/Deep-Learning-Papers-Reading-Roadmap>

<https://distill.pub/> is another resource we will use when it is relevant. For example they have a great paper on Attention Networks that will be covered during the RNN section of the course (<https://distill.pub/2016/augmented-rnns/>).

Signatures:

Signature of student:

Date: January 13, 2019

Approval Signatures:

Please read attached policies and procedures on independent studies before signing.

Supervising Faculty Member:

Name:

Signature:

Date: January 13, 2019

Instructor (if different from Supervising Faculty Member):

Name:

Signature:

Date: January 13, 2019

Director of Undergraduate Studies:

Name:

Signature:

Date: January 13, 2019

Print everything out, get all signatures, and take your paperwork to Karen Whitesell, the DUS Assistant, to obtain a permission number for a course.

To be completed by the DUS Assistant:

ASSIGNED COURSE AND SECTION NUMBER:

ASSIGNED PERMISSION NUMBER: