

From: webservices@illinois.edu
Subject: IGL Project Proposal
Date: July 24, 2019 at 12:10:02 AM CDT
To: gfrancis@illinois.edu

IGL Project Proposal

Webtools Form 2331998 submitted by:
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Mathematics, Staff
07/24/2019 12:09 A.M.

Illinois Geometry Lab - Fall 2019 - Project submission

1. *Project name:*

Computer visualization in experimental mathematics

2. *Project mentor name(s) (faculty):*

George Francis

3. *Project mentor email address(es):*

gfrancis@illinois.edu

4. *Is this a continuation of a former IGL project? If so, which semester and which project was it?*

No

5. *Please provide a project description.*

This project is about enabling mathematicians to communicate their research to a wider audience. The human brain receives 90 percent of its information visually, and devotes ten times as much of the cortex to vision (30pc) than it does to hearing. With the advent of computer graphics, we have easy access to 2,3,4 and more dimensional drawing and animation. It has become important even in math, as an essential part of the new discipline,

https://en.wikipedia.org/wiki/Experimental_mathematics.

We invite a member of any IGL project team to join us (even if only occasionally) to learn how to illustrate their subject more vividly. Emphasis is on programming real-time interactive computer animations which are accessible over the Internet on any browser.

6. *Project difficulty:*

Intermediate

7. *Please provide a few keywords that describe your project. (For example:*

data science, algebra, mathematical physics...)

Mathematical visualization, real-time web-based animation, dynamical systems, geometry, topology, physics, quasi-crystals, fractals, cellular automata, 3D models, homotopies, hypercubes.

8. *How often do you expect to meet with your team?*

Two weekly meetings and unlimited private consulting on-line.

9. *How many undergraduate students would you like to be on your team?*

(Most IGL project have four undergraduate participants.)

Up to 4 core members who have some graphics programming experience and who will be encouraged to assist novices and occasional visitors to the project. Advanced calculus and some linear algebra. And either a good memory of high school geometry, or a college level geometry course.

10. *Which (math) courses are prerequisites for this project? Are there specific mathematical topics students need to have studied in order to participate in this project?*

Advanced calculus and some linear algebra. And either a good memory of high school geometry, or a college level geometry course.

Total novices are welcome, we will teach you to code some gratifying animation which you will post on the web.

11. *What are the coding/software prerequisites for this project? If you anticipate using a certain software or programming language, please list this here as well.*

Total novices are welcome, we will teach you to code some gratifying animation which you will post on the web.

Core members should program (or at least read) one among Python, C/C++, HTML, Javascript. Experience with OpenGL, WebGL, DirectX or some other graphics library is welcome.

12. *Please list any additional information or preferences that might help us assign students to your project, but that should not be posted on the website.*

I have been impressed by the quality of the IGL projects which are periodically presented

to the public. But all of them could be greatly enhanced by better and more informative illustrations and visualizations. And, with the ability to "publish" real-time interactive animations on a webpage (in HTML5+Javascript +WebGL), students

can explain a classic theorem to their peers, friends, and even parents.

13. *Preferred graduate student:*

N/A

14. *Preferred undergraduate students:*

N/A

15. *If possible, please upload a picture that we can post on the IGL website next to your project description. (If this is not a picture you generated yourself, please make sure there is no copyright issue when posting it on the*

IGL website.)

<https://forms.illinois.edu/fileAuth/2019/07/24/275173.png>

On behalf of the IGL, thank you for submitting an IGL project! If you have any questions, please feel free to contact Philipp Hieronymi (phierony@illinois.edu).

Sometimes undergraduate students will approach you directly and ask you to allow them to be on your team. Please do not tell them that they can be on your team. Instead please tell these students to fill out the application. If you know this student and you absolutely want the student to be on your team, please let us know, but still ask her/him to fill out the usual application for undergraduates. We get over 200 applications each semester and sadly have to reject more than 60% of the students. We work to be as fair as possible to all our undergraduate students and therefore we require that all students fill out the application. Thank you!

Again, thank you very much for submitting an IGL project.

On behalf of the IGL leadership team,

Philipp Hieronymi