



Proposal     #823    

## ***Instructionally Related Activities Report Form***

SPONSOR: GEOFF DOUGHERTY  
PROGRAM/DEPARTMENT: MATH & APPLIED PHYSICS  
ACTIVITY TITLE: CERN INTERNSHIP  
DATE (S) OF ACTIVITY: 1<sup>st</sup> JUNE – 10<sup>th</sup> AUGUST, 2017

Please submit via email to the IRA Coordinator along with any supporting documentation at [david.daniels@csuci.edu](mailto:david.daniels@csuci.edu) within 30 days after the activity. Thank you for your commitment to engaging our students!

### **A. ADDRESS THE FOLLOWING QUESTIONS:**

(1) PROVIDE A DESCRIPTION OF THE ACTIVITY;

The student (Alexander Collins) joined a research group, and was supervised locally by Dr. Jihao Jiang, a CERN faculty member who is also part of the Stanford Working Group, for a period of 10 weeks. His project was "Detection of jets containing b-hadrons".

He helped develop techniques that would increase the efficiency of the current baseline taggers that the Large Hadron Collider uses to detect jets containing b-hadrons. Through the use of a neural network, he implemented significant improvements over the baseline algorithms. He used a variety of different machine learning techniques including parallel training and batch normalization, for overall upgrading and integration of new code. He will continue to work with Zihao through the school year, testing and finding more efficient ways to identify, or tag, b-jets.

(2) HOW DID THE ACTIVITY RELATE TO A COURSE(S) AND/OR LEARNING OBJECTIVES?

The activities were closely related to the preparatory courses (Phys 497), in which he learned how to program in ROOT and the basics of fundamental particle physics.

(3) WHAT DO YOU SEE AS THE STRENGTHS OF THE ACTIVITY?

The internship taught the student how to work collaboratively in a team with top international physicists and engineers, and take responsibility for a specific part of the team's project. It showed him the level of effort, commitment and performance required to succeed in such an environment. The project challenged his computing skills and understanding of nuclear particle collisions.

CERN faculty members generally take a 2-week vacation during the summer, but a back-up advisor was always available.

(5) HOW WOULD YOU IMPROVE THIS ACTIVITY FOR NEXT TIME?

It would be useful if coordination with CERN could deliver more specific details of each project that our students will work on at an earlier stage, say some weeks before they travel. We are hopeful that several students will travel next summer. (Six students are currently doing the preparatory course, Phys 497/163).

(6) WHAT DID YOU LEARN FROM THE PROCESS?

It was very interesting to be exposed to the procedures at CERN, and to see the multi-faceted research approach that has led to so many fascinating discoveries. It was also good to see that our best students are on a par with the best from around the world.

(7) WHAT ARE STUDENT RESPONSES TO THE ACTIVITY? ATTACH STUDENT EVALUATIONS OR ASSESSMENTS (IN ACCORDANCE WITH FERPA RESTRICTIONS YOU MUST REMOVE ALL PERSONALLY IDENTIFIABLE STUDENT INFORMATION)

TO FOLLOW

8) GIVE A SUMMARY OF EXPENSES FOR THE ACTIVITY (DO NOT INCLUDE ACCOUNTING STRINGS)

Accom	3905.56
Ground transport	56.50
Air	<u>2436.52</u>
Total	6398.58 (from an award of \$7220)

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**B. ATTENDEE LIST- SUPPORTING DOCUMENT:**

In addition to the report form, *in a separate document*, attach to your email a list of attendees complete with each student major and grade level. This for IRA Committee reference only and will not be published on the IRA website. Include your name and the title of your IRA activity on the document.

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California State  
University

**INSTRUCTIONALLY  
RELATED  
ACTIVITIES**

**C H A N N E L  
I S L A N D S**

**C.IMAGES FROM ACTIVITY:**

Please embed 3-5 images in this document (or attach in .JPEG format) that demonstrate student participation with captions/titles.



*Figure 1 Alex Collins (far right) and research group at CERN*



*Figure 2 Alex and colleague at CERN*



Figure 3 Dr. Dougherty and Alex Collins at CERN



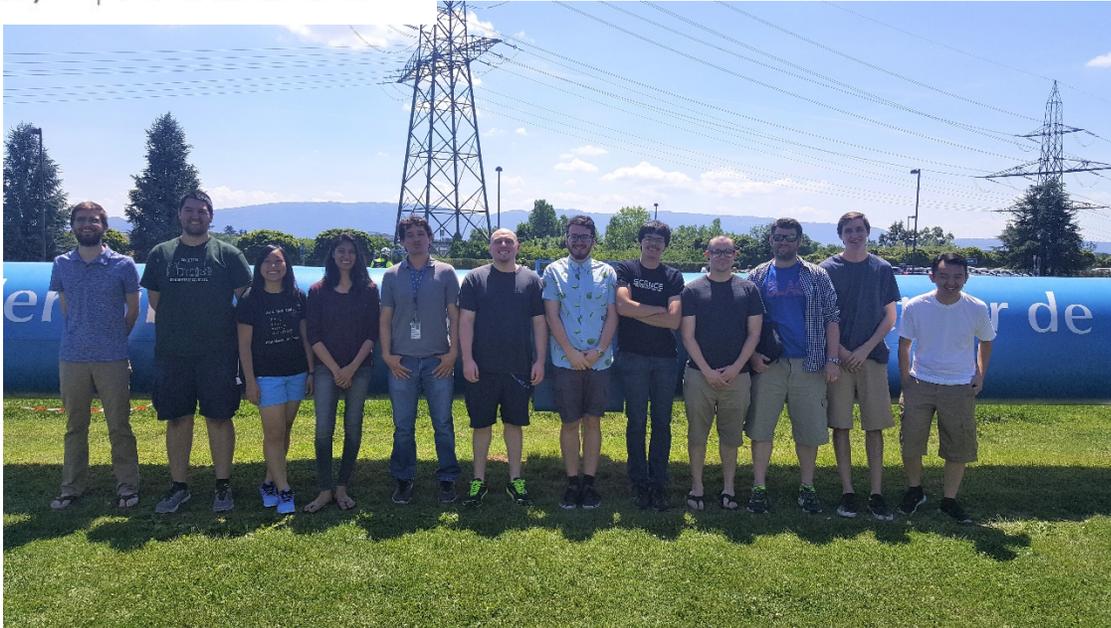
Figure 4 Collision data collector



California State  
University

**INSTRUCTIONALLY  
RELATED  
ACTIVITIES**

C H A N N E L  
I S L A N D S



*Figure 5 CSU interns*

Dr. Geoff Dougherty – “CERN Internship” (IRA #823)

Student Attendee:

Alexander Collins    Major: Computer science    Grade level: Senior

# Student Evaluation of Instructional Related Activity

Title of Activity: \_CERN internship

Sponsor: CERN

Which course(s) that you are currently taking did this activity relate to:

- Intro to Artificial Intelligence/Neural Networks (COMP 469)

How:

The project that I worked on at CERN was identifying jets containing b-hadrons using a recurrent neural network and the class that I am currently taking, COMP 469, deals with Artificial Intelligence using neural networks to perform specific tasks. So it will be interesting to see the variety of uses for neural networks as they can be very beneficial in a wide range of tasks and fields of study, i.e. physics and computer science based projects.

Suggestions or comments:

- Overall an incredible and once in a lifetime experience that I am very thankful to Professor Dougherty, Dr. Gao, and CSUCI for.
- The Activity has taught me many valuable lessons academically and in life. It also allowed me to get insight as to what a career in the field of physics and more so particle physics would be like and what I could expect
- Professor Dougherty was extremely helpful and made the trip/activity much more enjoyable as he made the trip as hassle free as possible. He also went out of the way to try and get me funding for the trip which was extremely helpful and made the whole trip possible for me.
- Only suggestion: It doesn't pertain to the trip itself but I could see that if financial aid was given for future students that the fact that the funds aren't readily available could be problematic to students who aren't as financially stable as I was to pay for the accommodations upfront and get reimbursed later