

Request for Technology Fee Funds: FY20

NOTE: A separate request should be made for each initiative.

I. Department Number/Department Name:

| | |
|---|----------------------|
| 360 | College of Computing |
| Leveraging Behavioral and Physiological Feedback to Improve Learning Environments | |

Title of Request (please be brief):

Amount of Request (formula from detailed budget below):

\$104,020

Type of Proposal: Atlanta or Dist Lrng/Non-Atl

Atlanta

Was this project request funded in FY19?

| | |
|----|-------------|
| No | (Yes or No) |
|----|-------------|

Are there installation/renovation costs associated with this request?

| | |
|----|-------------|
| No | (Yes or No) |
|----|-------------|

If "Yes" then indicate the source of approved funding:

(Note: Tech Fees are not allowed for installation/renovation)

Executive Summary of Request (100 words or less):

Lack of personal, face-to-face interaction in large classes makes it challenging for instructors to "read the room". We propose to purchase 100 Empatica E4 wrist-worn devices and provide these to consenting students in the x641 classes to help professors read student engagement.

Specific class and/or lab initiative(s) if applicable:

Contact person for this request (incl. phone #):

Elizabeth DiSalvo (678) 640-2844

Responsible faculty for this request (incl. phone #)

Thomas Ploetz (404) 226-5011, Elizabeth DiSalvo

Indicate priority per department if applicable:

Number of

Indicate priority per college or unit:

Number 5 of 9

II. Impact on Students - Provide course title, course number, and anticipated enrollments:

Titles/Numbers of Course(s)

Machine Learning CS 7641 & 4641

Anticipated Enrollments

| | | | | |
|----------------|-----|------|----|-------------|
| Graduate: | 469 | (per | yr |) sem or yr |
| Undergraduate: | 297 | (per | yr |) sem or yr |
| Total: | 766 | | | |

The estimated percent use of the resources in the item by:

| | |
|----------|------|
| Students | 100% |
| Faculty | |
| Other | |
| Total: | 100% |

Brief explanation of how estimate was achieved.

Our estimates are based on previous enrollments of 7641 and 4641.

NOTE: Other impacts on students should be described in narrative to include benefits to the students affected.

III. Detailed Budget - Requested Items by Category *List separately any equipment, software, and other allowable expenses (see Tech Fee Guidelines). There is a formula in the "total column" that multiplies the number of items times the unit price. You may enter a figure into the total column if the unit pricing is not applicable. If you need additional rows, contact the Budget Office to receive a modified form. Software or data license proposals should indicate how many years the item has been funded through student tech fees in narrative.*

Supporting documentation is required- Include price justification in some form, such as quotations, published price lists, etc. as a separate PDF attachment. All supporting information should be in a single PDF.

| Proposed Number of Items | Estimated Price per Unit | Total (\$) |
|--------------------------|--------------------------|------------|
|--------------------------|--------------------------|------------|

| | | | |
|--|-----|---------|----------|
| Empatica E4 wrist-worn device with EDA/GSR sensors | 100 | \$970 | \$97,006 |
| High Performance Computing Storage System for E4 data (details att | 1 | \$6,114 | \$6,114 |
| Shipping costs for all 325 E4 devices | 1 | \$900 | \$900 |
| | | | \$0 |
| | | | \$0 |

Total (linked to the total amount of request line above)

\$104,020

Please return form via e-mail in Excel format to: techfees@business.gatech.edu. Supporting information only in a PDF file.

IV. Narrative - Provide narrative justification for your intended use of the technology fee funds. Include narrative on how the education or research of the students will be enhanced. To include curricular, co-curricular, and extracurricular benefits expected to accrue to students through provision of this resource, including students outside the unit. Briefly state how information regarding similar technology use elsewhere on campus to benefit from lessons learned, to standardize, or differentiate, and to avoid duplication. Also include how the request aligns with the Strategic Plan of Georgia Tech.

We are exploring how wearable technology can be leveraged in classrooms with large enrollments (both in-person and online), to provide new kinds of observations for instructors, and as feedback to individual students. Lack of personal, face-to-face interaction in large classes makes it challenging for instructors to “read the room” and gauge whether students are engaged, bored, or distracted.

We have conducted preliminary, NSF-funded, IRB-approved research on the use of wearable devices during learning sessions (see: <https://gvu.gatech.edu/hg/item/611005>).

Our research finds that it is highly likely that wrist-worn sensor data (e.g., GSR, accelerometry, heart rate) contain reliable signals of distraction, engagement, and boredom, all of which could help professors of large courses to read the room. It is now time to test and leverage our discoveries at a large scale in the classroom. To do so, we plan to purchase 100 Empatica E4 wrist-worn devices: <https://www.empatica.com/research/e4/>

We will provide these devices to consenting students in the x641 classes, to conduct anonymous classroom research on student engagement. By coupling the use of these devices with self-report data on student engagement, we plan to develop new approaches for instructors to more easily take the pulse of the classroom, as it scales to larger sizes.

The knowledge gained from use of the sensor and self-report data in large, in-person classrooms will inform similar approaches to gauging boredom, distraction, and engagement in other large classrooms on campus, and, perhaps more importantly, online learning scenarios down the road (e.g., OMSCS courses).

The data we collect will feed analytics techniques to create robust models of engagement in large classrooms and will provide feedback to instructors. For example, when a significant portion of the classroom is bored or distracted, this information (*not information about an individual student) will be provided to instructors, in near real time. Thus, instructors can adjust their teaching, improving the education of the students in large classrooms (in-person and online).

Our data collection and analytic techniques will also enable us to develop new candidate outcome measures for learning in large classes. It can provide a new form of data that could be used, down the road, in the assessment of many different courses, taught in-person and online. Thus, the technology funded by this proposal will unlock analytic insights and models that will inform instruction in any large classroom. It will contribute to an infrastructure that will reason continuously about how student learning is enabled or inhibited, over time and at scale, for any large class. It will help instructors adapt classroom activities (e.g., adding or removing activities) and understand the effect of these adaptations on boredom, engagement and distraction, using wearable sensing as a key data stream for doing so.

As such, the technology funded by this proposal, and the research it enables, is well-aligned with Georgia Tech's strategic plan. It directly leverages technology to enhancing learning by making feedback to instructors possible in large classes. It also allows for knowledge transfer of the contributing factors in classrooms to boredom, distraction, and engagement. It preserves educational quality while making the experiences of many students more accessible to instructors, and it unlocks new approaches to assessing course content and classroom activities, to increase effectiveness and establish new practices for managing and adapting content and activities in classes with very large enrollments.

