PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 36th cycle

Research Area n. 1 - Computer Science and Engineering

Research Field: CHANGE AND ANOMALY DETECTION IN MULTIVARIATE AND HETEROGENEOUS DATASTREAMS

<table>
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<th>Monthly net income of PhDScholarship (max 36 months)</th>
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<td>€ 1300.0</td>
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In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

**Motivation and objectives of the research in this field**

Change and anomaly detection problems are frequently encountered in science and engineering, with relevant applications in the industry and quality control. The vast majority of monitoring algorithms are however meant for data that i) are real-valued, ii) are independent over time and iii) can be represented in a vector/matrix form. These assumptions, dictated by either practical and theoretical limitations, prevent using most algorithms in important industrial monitoring problems, where data are categorical, characterized by temporal dependencies that are difficult to model, and asynchronously acquired. STMicroelectronics will sponsor a PhD grant to foster research on these fundamental problems in change/anomaly detection, and develop novel strategies and solutions based on statistics and machine learning.

**Methods and techniques that will be developed and used to carry out the research**

The research will investigate statistical techniques for sequential monitoring (including Baysian methods), core machine learning solutions that can cope with categorical variables, as well as signal processing methods (either based on statistical models, or on entirely data-driven / deep learning models) to cope with data that have to be conveniently handled as signals.

**Educational objectives**

The PhD candidate will develop a strong background in
machine learning and applied statistics, together with very practical engineering skills thanks to the strict collaboration with our industrial partners.

Job opportunities

The PhD candidate will address fundamental problems with a broad applicability in the field of quality control and predictive maintenance. A PhD graduate with such a background can be very valuable in STMicroelectronics as well as many other large companies / SME.

Composition of the research group

0 Full Professors
1 Associated Professors
0 Assistant Professors
5 PhD Students

Name of the research directors

Giacomo Boracchi

Contacts

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http://home.deib.polimi.it/boracchi/

Additional support - Financial aid per PhD student per year (gross amount)

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<th>Housing - Foreign Students</th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
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<tr>
<td></td>
<td>1500.0 €</td>
<td>1000.0 €</td>
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<td>per student</td>
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max number of financial aid available: 4, given in order of merit ..

Housing - Out-of-town residents (more than 80Km out of Milano)

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Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

LIST OF UNIVERSITIES, COMPANIES, AGENCIES AND/OR NATIONAL OR INTERNATIONAL INSTITUTIONS THAT ARE COOPERATING IN THE RESEARCH: ST Microelectronics, SRA; Tampere University.

The PhD will be co-supervised by the Applied Math team in SRA (System Research and Application) at STMicroelectronics. The Applied Math team features 3 senior researchers and a few MSs students that are doing their stage in STMicroelectronics. PhD candidate will be asked to contribute to the MSs students\^\_\_\_\_\_\_\_\_\_ supervision, and to do regular visits in STMicroelectronics.

INCREASE IN THE SCHOLARSHIP FOR STAYS ABROAD: Euro 566.36 per month, for up to 6 months
EDUCATIONAL ACTIVITIES (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student per year
2nd year: euros per student (1534)
3rd year: euros per student (1534)

TEACHING ASSISTANSHIP: (availability of funding in recognition of supporting teaching activities by the PhD student)
There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

COMPUTER AVAILABILITY:
1st year: individual use
2nd year: individual use
3rd year: individual use

DESK AVAILABILITY:
1st year: individual use
2nd year: individual use
3rd year: individual use