

StatNet

Network for Advanced Statistical
Methods in Particle Physics

*proposal submitted in January 2016 for
Marie-Curie ITN (MSCA-ITN-ETN)*

- Network to develop advanced statistical methods for Particle Physics
- Collaboration with several European university and some non-academic partners.
- Finance PhD students to work on several statistical projects
 - secondments at CERN to integrate developed statistical software into ROOT
- Proposal submitted beginning in January 2016 but unfortunately not approved.
- Plan to re-submit this year by extending project to additional organizations and with an extra work package

Abstract

The StatNet Innovative Training Network will develop and apply advanced statistical methods for Particle Physics. Statistical analysis is a crucial element in the search for new fundamental particles and processes using, for example, high-energy proton collisions at the Large Hadron Collider (LHC). The statistical modelling of the enormous data sets collected in such experiments must exploit the maximum information available and quantify accurately all sources of experimental uncertainty. StatNet will develop physically motivated models that achieve this goal, and implement them in software that can be used by the broader Particle Physics community as well as in other fields. Such models contain in general large numbers of parameters, and without proper care these can ruin one's ability to make inference about the relatively few parameters of physical interest, such as the rate of a new signal process. Bayesian statistics provides a powerful framework for treating complex multi-parameter problems, but entails severe computational difficulties. StatNet will develop novel algorithms to address these issues and thus provide a valuable contribution to the science produced in Particle Physics as well in other disciplines. The StatNet projects will not only develop but also apply the statistical tools in experiments such as those at the LHC, ensuring that the methods can cope with the complexities of real experimental settings. The participating institutes in StatNet have a long track record of innovation and education in statistical data analysis, and their expertise will form the core of the training provided. In addition, secondments with partners in other disciplines such as Information Technology, Climate Science and Finance will allow participants to view statistical and computational problems from multiple viewpoints and to exchange ideas between these areas and Particle Physics.

List of Participants for last submission (2016)

Beneficiaries

1	ROYAL HOLLOWAY AND BEDFORD NEW COLLEGE	United Kingdom
2	UNIVERSITETET I OSLO	Norway
3	ISTITUTO NAZIONALE DI FISICA NUCLEARE	Italy
4	MAX PLANCK GESELLSCHAFT ZUR FÖRDERUNG DER WISSENSCHAFTEN E.V.	Germany
5	STICHTING VOOR FUNDAMENTEEL ONDERZOEK DER MATERIE - FOM	Netherlands
6	KPMG ADVISORY NV	Netherlands

Partners

Partner Organisation number	PIC Search PIC	Organisation legal name	Country	Academic Sector	Role of associated	
					Provide training	Host secondments
1	923796670	Digitalcomœdia S.r.L.	Italy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	998157161	CICERO SENTER KLIMAFORSKNING	Norway	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	922093091	Fiscal Technologies	United Kingdom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	999988133	EUROPEAN ORGANIZATION FOR N	Switzerland	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	999976590	UNIVERSITA DEGLI STUDI DI NAPO	Italy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	923561639	JEOL (Germany) GmbH	Germany	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	999978433	LUDWIG-MAXIMILIANS-UNIVERSITA	Germany	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Participating Institutes in 2016

People / Institutes

Glen Cowan, Michele Fauci-Giannelli / RHUL

Allen Caldwell / MPI Munich

Wouter Verkerke / Nikhef

Luca Lista / INFN Napoli

Alex Read / University of Oslo

Lorenzo Moneta / CERN



Plans for Re-Submission

- Plan to resubmit the proposal for January 2017
 - Extend work packages
 - WP1: Develop new algorithms for use in Bayesian Computation
 - WP2: Statistical Modelling
 - WP3: Machine Learning (**New**)
 - Possibly increasing the number of students from 11 to 15 ?
- Have CERN as a participant (beneficiary) and not as a partners
 - 1 or 2 students (junior fellows) will be hosted by CERN for 24 or 36 months
- Extend network with additional participants and partners
 - INFN Padova, Lund University, DESY, Pangea (Italian company)