

Joint Gaia/ LSST Astro-Visualisation School

Location: University of Washington, Seattle, USA

Date of School: 13-18 Sep 2012

Contact: Nicholas A Walton, Institute of Astronomy, University of Cambridge, UK

Abstract: This workshop was jointly organised by the Gaia GREAT networks, University of Washington (representing the LSST Consortium) and Microsoft Research. It provided a theoretical exploration of the latest data visualisation techniques, and also hands-on practicals illustrating specific data challenges that will be presented by the upcoming Gaia and future LSST missions and telescopes.

Programme Outline

All talks and presentations are available on the meeting wiki page at <http://great.ast.cam.ac.uk/Greatwiki/GreatItn/VizSchoolSep2012>

When?	What?	Key Speakers?
Day 1: Thursday 13 September 2012		
09:00-12.30: Session 1	Connecting Research With Education Workshop	20 research scenarios that require new computational practice – round table discussion: Goodman, Mahabal, Cui, Wong, Hogg, Djorgovski, Longo, Dozier, Crutchfield, Borne, Walton, Norris, Brunner, Xu. This session was held jointly with the AstroInformatics 2012 conference.
12.30-14.00	<i>Lunch</i>	
14:00-17:00: Session 2	Tour of Microsoft Research laboratories.	Led by Jonathan Fay (MSR)
Day 2: Friday 14 September 2012		
09:00-10.30: Session 3	The World Wide Telescope (WWT) and Planetarium's	Andrew Connolly
11:00-12.00: Session 4	WWT Deep Drive: Part 1	Jonathan Fay
12:00-13:00	<i>Lunch</i>	
14:00-15.30: Session 5	WWT and Layerscape	Rob Fatland
16:00-17.30: Session 6	WWT Deep Drive: Part 2	Jonathan Fay
		These Friday sessions were organised jointly with the AstroInformatics 2012.
Day 3: Saturday 15 September 2012		
09:00-10.30: Session 7	Introduction & Gaia Science/Data/Visualisation Challenges	Nicholas Walton, Caroline Soubiran/ Wil O'Mullane
11:00-12.30: Session 8	LSST Science/Data/Visualisation	Zeljko Ivezic

When?	What?	Key Speakers?
	Challenges	
12.30-13.30	Lunch	
Day 4: Monday 17 September 2012		
09:00-10.30: Session 9	Gaia: catalogue data visualisation	Wil O'Mullane/ Mark Taylor
11:00-12.30: Session 10	Practical session 1	Led by: Mark Taylor
12:30-13:30	Lunch	
14:00-15.30: Session 11	Gaia: spectral data visualisation	Igor Chilingarian/ Juan Gonzalez
16:00-17.30: Session 12	Practical session 2	Led by: Igor Chilingarian/ Juan Gonzalez
Day 5: Tuesday 18 September 2012		
09:00-10.30: Session 13	LSST: image visualisation	Robert Lupton
11:00-12.30: Session 14	Practical session 3	Led by: Robert Lupton
12:30-13:30	Lunch	
13:30-15.00: Session 15	Practical session 4	Led by: Andy Connolly
15:30-16.45: Session 16	LSST: Big Data	Mario Juric
16:45-18.00: Session 17	Student Presentations and wrap-up	Led by: Nic Walton

Aims

The School covered a range of topics – with lectures and practical sessions focussed on the visualisation and data challenges presented by Gaia and LSST, covering the range of data types to be encountered, thus astrometric, photometric, spectroscopic, temporal. The lectures covered present day state of the art tools available for use – both client side and server side. The students gained practical experience of capabilities such as those developed through the Virtual Observatory movement – for instance TopCat (for table data visualisation), VOSpec (spectral data handling) and Aladin (for image integration) – together with pipeline technologies such as SAMP (Simple Application Messaging Protocol) and workflow tools (e.g. Taverna). The lectures covered applied computational topics showing the latest advances in high through put visualisation such as systems deploying large graphical processing unit (GPU) clusters to parallelise server side manipulation of Tera-scale data cube handling, coupled with client tools for the end result visualisation.

The school benefitted by being partly overlapping with the AstroInformatics 2012 conference (also in Seattle). The first day of the School addressed computation in education in general with a panel discussion of leaders in the field of High Performance Computational Science. The first day will also included a tour of the Microsoft Research HQ facilities, enabling the attendees to gain an insight into state of the art facilities and infrastructures used in the IT industry. The second day focused on the use of the Microsoft's WorldWide Telescope system for astronomical visualisation, This day was hosted the state of the art planetarium at the University of Washington. The core three days of the school moved to topic based lectures coupled with associated practical sessions. The students, organised into four groups, were asked to make a short presentation of their group work at the end of the School.

All material generated at the School is available on the school wiki site at <http://great.ast.cam.ac.uk/Greatwiki/GreatItn/VizSchoolSep2012>

School Lecturers

The School was led by a number of experts from the Gaia and LSST communities, focussed on the challenges involved in the analysis, handling and visualisation of the large and rich data from these missions.

- Igor Chilingarian (Smithsonian Astrophysical Observatory): Igor is an expert in the utilisation of Virtual Observatory technologies for the handling and visualisation of rich data sets. He tutored on use of spectral analysis tools for spectral data visualisation.
- Andrew Connolly (University of Washington): Andy leads the LSST effort in developing large scale data processing suitable to handle the mass LSST data. He was a technical lead in the development of Google Sky. Andy tutored on the use of WWT for Planetariums.
- Jonathan Fay (WWT, Microsoft Research): Jonathan is lead developer of Microsoft's World Wide Telescope. He tutored on the use of WWT for data visualisation, and its integration with Virtual Observatory systems.
- Juan González (ESA, ESAC): Juan is a lead developer of the ESA VOSpec tool, and part of the ESA team developing systems to support the ESA Gaia science archive. He lectured on the visualisation of spectroscopic data and in particular that from the Gaia RVS.
- Zeljko Ivezić (University of Washington): Zeljko is System Scientist of the LSST. He gave a lecture on the data challenges of LSST.
- Mario Juric (Harvard-Smithsonian Center for Astrophysics): Mario is the LSST Data Management Project Scientist. He gave a lecture on the challenges of 'Big Data'.
- Robert Lupton (Princeton): Robert is the Algorithms Expert member of the LSST Science Council. He led the development of the SDSS data pipelines and now has a leading role in this area in Pan-STARRS and LSST. He will tutored on the development and use of Python based data pipelines.
- William O'Mullane (ESA, ESAC): Wil leads the Science Operations Development Manager for Gaia. He tutored on the visualization of Gaia and present an overview of challenges presented by Gaia.
- Caroline Soubiran (Obs de Bordeaux): Caroline leads the Ground Based Observations Group for Gaia and is a member of the Gaia Science Team. Her lecture covered issues related to the integration of RVS spectral data required from Gaia.
- Mark Taylor (University of Bristol): Mark is an Astronomical Software Engineer, and leads the development of the TopCat analysis suite. He tutored on the visualisation and handling of tera scale catalogue data.
- Nicholas Walton (University of Cambridge): Nic a member of the Gaia Science Team. He leads the GREAT network. He introduced the School, and lectured on the visualisation challenges involved in maximising the science return from Gaia.

School Attendees

Timothy Anderton	University of Utah
Nadia Blagorodnova	IoA, University of Cambridge
Tristan Cantat-Gaudin	INAF-Padova
Sergi Blanco Cuaresma	Obs de Bordeaux
James Davenport	University of Seattle
Diego Fustes	University of Alicante
Duncan Fyfe	University of Leicester
Shea Garrison-Kimmel	Univ California, Irvine
Jason Hunt	MSSL/UCL

Cheng Liu	Lund Observatory
Timothy Luciani	Univer Pittsburgh
Stefan Jordan	ARI, Heidelberg
Suzanne Lorenz	Purdue
Andre Martins	Obs de Besancon
Krzysztof Nienartowicz	Geneva Observatory
Max Palmer	UB, Barcelona
Toni Santana	AMU, Poznan
Iulia Simion	IoA, University of Cambridge
Bayard Stringer	University of Utah
John Vickers	ARI, Heidelberg
Lucianne Walkowicz	Princeton University
Kyle Willett	Univer Minnesota

School Organising Committee

The organising committee was composed of representatives from the Gaia/ GREAT community, the LSST, Microsoft Research and the organisers of the AstroInformatics conference series.

- GREAT-ITN: , Floor van Leeuwen (University of Cambridge, UK), Xavier Luri (University of Barcelona, E), Wil O'Mullane (ESAC, ESA, E), Caroline Soubiran (University of Bordeaux, F), Nicholas Walton (co-Chair: University of Cambridge, UK)
- Microsoft Research: Jonathan Fay (MSR, Redmond, USA), Yan Xu (MSR, Redmond, USA)
- LSST: Andrew Connolly (co-Chair: University of Washington, USA), Zeljko Ivezic (University of Washington, USA)
- AstroInformatics2012: Ashish Mahabal (Caltech, USA)

The **Local Organising Committee** included: Andy Connolly, Sarah Garner, Simon Krugoff and Andy Becker.

Venue

The main school was held at the Department of Physics and Astronomy at the University of Washington, Seattle, USA. The first day of the meeting was held jointly as part of the AstroInformatics 2012 conference (<http://www.astro.caltech.edu/ai12/>), to be located at Microsoft Research in Redmond, USA. The second day was held at the University of Washington's new Planetarium.

Sponsors:

This meeting was supported by the EC FP7 GREAT-ITN programme (under grant agreement n° 264895) (see <http://www.great-itn.eu>), the GREAT-ESF RNP programme (<http://www.great-esf.eu>), The University of Washington, the LSST Corporation, and Microsoft Research.