



13th Summer School on **SCIENTIFIC VISUALIZATION**

School Presentation

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SuperComputing Applications and Innovation Department





OUTLINE

- General info's
- Analysis of student background and interests
- School timeline
- Lecturers CV
- Schedule of the day



GENERAL INFO'S

- School schedule
- Lunches
- Other info



STUDENTS BACKGROUND (<3 minutes each)

- Background
- Interests in Visualization
- Basic Technical Knowledge:
 - Python programming,
 - Qt,
 - VTK,
 - Paraview
 - Blender



OVERVIEW AND SCHOOL TIMELINE

Day1	Time	Title	Argument	Lecturers
Day1	9.30-10.15	School presentation and introduction to Sci Viz	General	Raffaele Ponzini
	10.15-11.15	Introduction to Python Language	Python	Alice Invernizzi
	11.15-11.30	coffe-Break		
	11.30-13.00	Tutorial	Python	Alice Invernizzi
	13.00-14.30	lunch-break		
	14.30-16.00	Basic tools for scientific visualization in Python	Python in SciViz	Alice Invernizzi
	16.00-17.00	Tutorial	Python in SciViz	Alice Invernizzi
Day2	Time	Title	Argument	Lecturers
Day2	9.30-10.30	Introduction to VTK	VTK	Stefano Perticoni
	10.30-11.15	Pipelines in VTK	VTK	Stefano Perticoni
	11.15-11.30	coffe-Break		
	11.30-13.00	Filtering in VTK	VTK	Stefano Perticoni
	13.00-14.30	lunch-break		
	14.30-17.00	Tutorial	VTK	Stefano Perticoni
Day3	Time	Title	Argument	Lecturers
Day3	9.30-11.15	Introduction to Paraview GUI	Paraview	Raffaele Ponzini
	11.15-11.30	coffe-Break		
	11.30-13.00	Filtering using Paraview	Paraview	Raffaele Ponzini
	13.00-14.30	lunch-break		
	14.30-15.30	Paraview scripting	Paraview	Raffaele Ponzini
	15.30-17.00	Tutorial	Paraview	Raffaele Ponzini
Day4	Time	Title	Argument	Lecturers
Day4	9.30-11.15	Introduction to Blender	BLENDER	Francesca Delli Ponti
	11.15-11.30	coffe-Break		
	11.30-13.00	Tutorial	BLENDER	Francesca Delli Ponti
	13.00-14.30	lunch-break		
	14.30-15.30	Introduction to GUI development using QT	Qt GUI	Andrea Negri - Paolo Quadrani
	15.30-17.00	Tutorial	Qt GUI	Andrea Negri - Paolo Quadrani
Day5	Time	Title	Argument	Lecturers
Day5	9.30-10.30	Remote Visualization tools	Remote Visualization tools	Spisso/Calori (tbd)
	11.15-11.30	coffe-Break		
	11.30-13.00	Case History Visualization in CFD problems	Case History	Ivan Spisso
	13.00-14.30	lunch-break		
	14.30-16.00	Case History Visualization in CFD problems	Case History	POLITO (invited-confirmed)
	16.00-17.00	Question and Answer	Open	Invernizzi/Ponzini



LECTURERS CV

- Coordinators & Lecturers: A. Invernizzi; R. Ponzini
- Lecturers (CINECA/SCS): S. Perticoni; I. Spisso; A. Negri; P. Quadrani; F. Delli Ponti
- Lecturers (invited): D. Gallo - Politecnico di Torino, Italy.



A. Invernizzi



She obtained the Bachelor Degree in Mathematical Engineering from the Politecnico di Milano (2004) and the Master Degree in Mathematical Engineering from the Politecnico di Milano (2007) with specialization in Scientific Computational Method for Engineering.

Her main activity at CINECA concerns development, optimization, parallelization of scientific codes and porting on GPU of C/C++ code. Her working domain involves also management and configuration of software on HPC system.

She is also teacher of courses on C/C++ and Python programming, GPU computing, optimization strategies and HPC tools for scientific programming.



R. Ponzini



Raffaele Ponzini has a PhD (cum Laude) and a master's degree in Bioengineering from the Politecnico di Milano. His research interests include **computational models in hemodynamics**, and **scientific visualization**. Since 2003 he worked as a member of the **High Performance Computing group of CILEA** for the management of fluid dynamics computational codes. His working domain includes also teaching **C/C++** and **Python programming for scientific applications**. Starting from September 2012 he's working at **CINECA** within the **Supercomputing Applications and Innovation Department**.

CINECA SCAI: <http://www.hpc.cineca.it/staff/ponzini-raffaele-0>

Research gate: https://www.researchgate.net/profile/Raffaele_Ponzini/



S. Perticoni



He took his Electronic Engineering Degree, specializing in Optoelectronics, from the "Politecnico di Milano" university in 2001. From early 2002 to early 2007 he worked for **Istituti Ortopedici Rizzoli** as research engineer in developing computer-aided tools for preoperative planning. In 2007 he joined **SCS SuperComputingSolutions** as research engineer and OpenMAF developer.

- portfolio: <http://portfolio.stefanoperticoni.org/>
- linkedin: <http://www.linkedin.com/in/stefanoperticoni>
- blog: <http://www.stefanoperticoni.org>
- email: s.perticoni@scsitaly.com



P. Quadrani

Degree in electronic engineering at University of Bologna.

At CINECA I'm working as senior software engineer with special focus on scientific visualization and user interface development.

A. Negri

Degree in Computer Science Engineering received at University of Modena and Reggio Emilia.

At CINECA working on user interfaces and user experience in the ENI R&D group.



F. Delli Ponti



Degree in engineering and member of the Order of Engineers in Bologna.

Five years of professional experience in managing simulation of traffic to urban road networks and traffic control projects.

Main expertises: knowledge of computer graphics applied in particular to Cultural Heritage field, GIS (Geographic Information System) and different 2D and 3D graphics software.

Main tasks: processing and management of GIS data, modeling, texturing and animation of 3D models for reconstruction of real time virtual environments and making video.



I. Spisso

Ivan Spisso works in CINECA since July 2010. His works concerns with the installation, support and maintenance on the CINECA's HPC ecosystem of the CFD codes widely used by industries and the academia. The most relevant industries that has used efficiently CINECA'S HPC facilities are BMW-Oracle Racing Design Team CFD, Luna Rossa Challenge, Ferretti, Bombardier, ENI, Dallara.

He has been the technical consultant for the production runs of the CFD analysis during the last AMERICA'S cup for the winner BMW-Oracle Racing Design and Luna Rossa Challenge.

He has been the organizer of the Workshop on "HPC enabling of OpenFOAM for CFD applications" held in CINECA in November 2012 and March 2014.

He supports the user community with the use of the remote visualization services used in CINECA's HPC ecosystems.








D. Gallo



Diego Gallo is a post-doctoral fellow at the Politecnico di Torino, Italy. He obtained his B.S., M.S., and Ph.D. degrees in Biomedical Engineering from Politecnico di Torino, Italy. He has been a visiting student at the Biomedical Simulation Laboratory of the University of Toronto (ON, Canada) in 2011. Dr. Gallo's research interests are in the areas of cardiovascular fluid dynamics. His work focuses on the use of computational fluid dynamics models to improve the understanding, diagnosis and treatment of vascular diseases.



SCHEDULE OF THE DAY

10.00-11.15		Introduction to scientific Visualization
11.15-11.30		coffe-Break
11.30-12.30		Introduction to Python Language
12.30-13.00		Tutorial
13.00-14.30		launch-break
14.30-16.00		Basic tools for scientific visualization in Python
16.00-17.00		Tutorial



OUTLINE

- Definition
- Why visualization
- Pioneers
- What is not scientific visualization
- What is scientific visualization
- Examples
- Topics covered by the school



Definition

Scientific visualization (also spelled scientific visualisation) is an interdisciplinary branch of science according to Friendly (2008) "primarily concerned with the visualization of three-dimensional phenomena (architectural, meteorological, medical, biological, etc.), where the emphasis is on realistic renderings of volumes, surfaces, illumination sources, and so forth, perhaps with a dynamic (time) component".

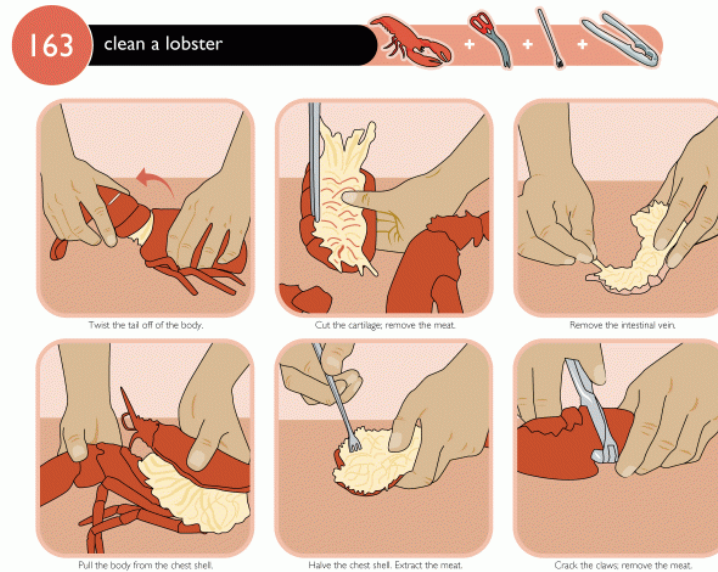
It is also considered a branch of computer science that is a subset of computer graphics.

The purpose of scientific visualization is to graphically illustrate scientific data to enable scientists to understand, illustrate, and glean insight from their data.

[wikipedia, scientific visualization]



Why visualization



<http://www.showmenow.com/>

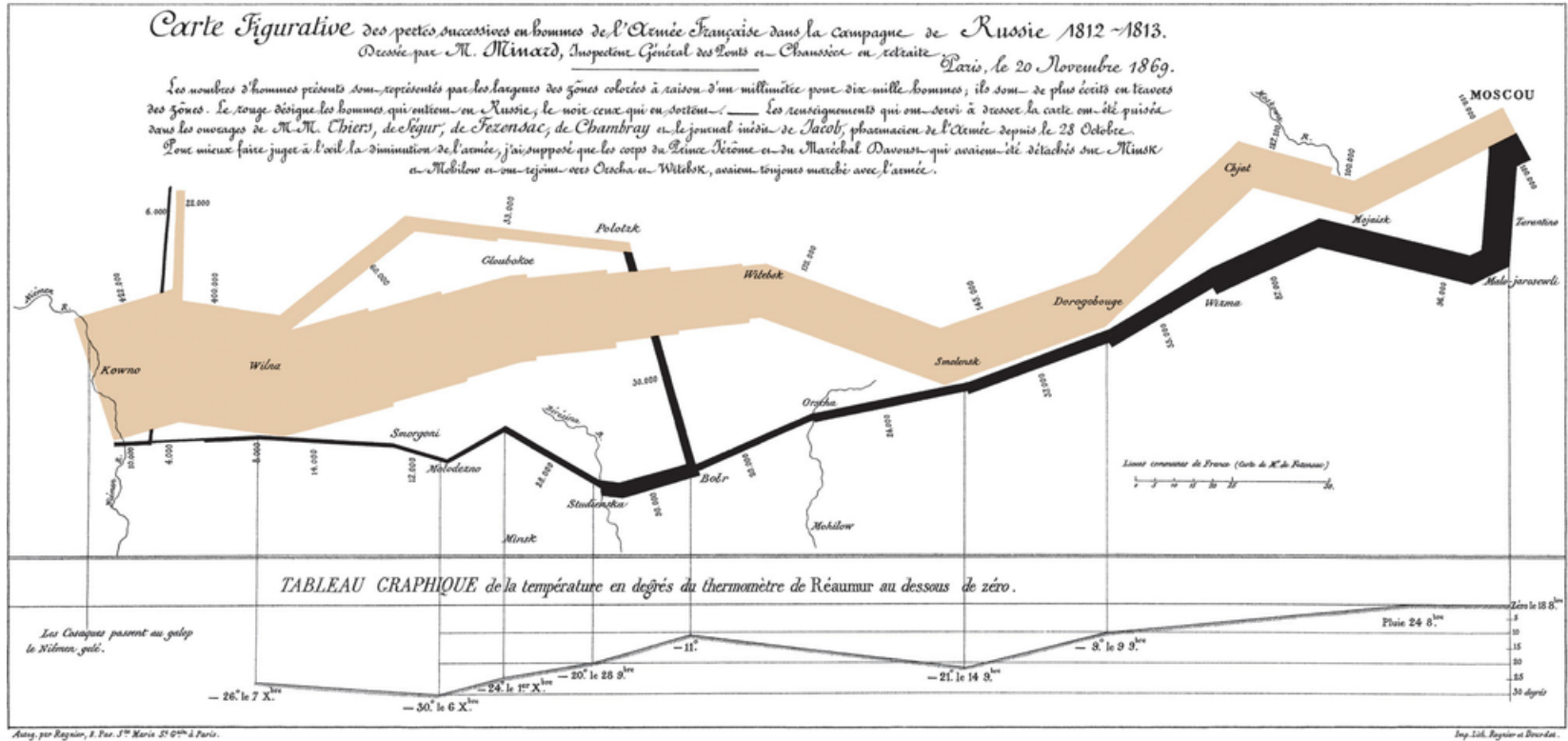
[..] His philosophy on scientific computing appears as preface to his 1962 book on numerical methods:

The purpose of computing is insight, not numbers

[...]

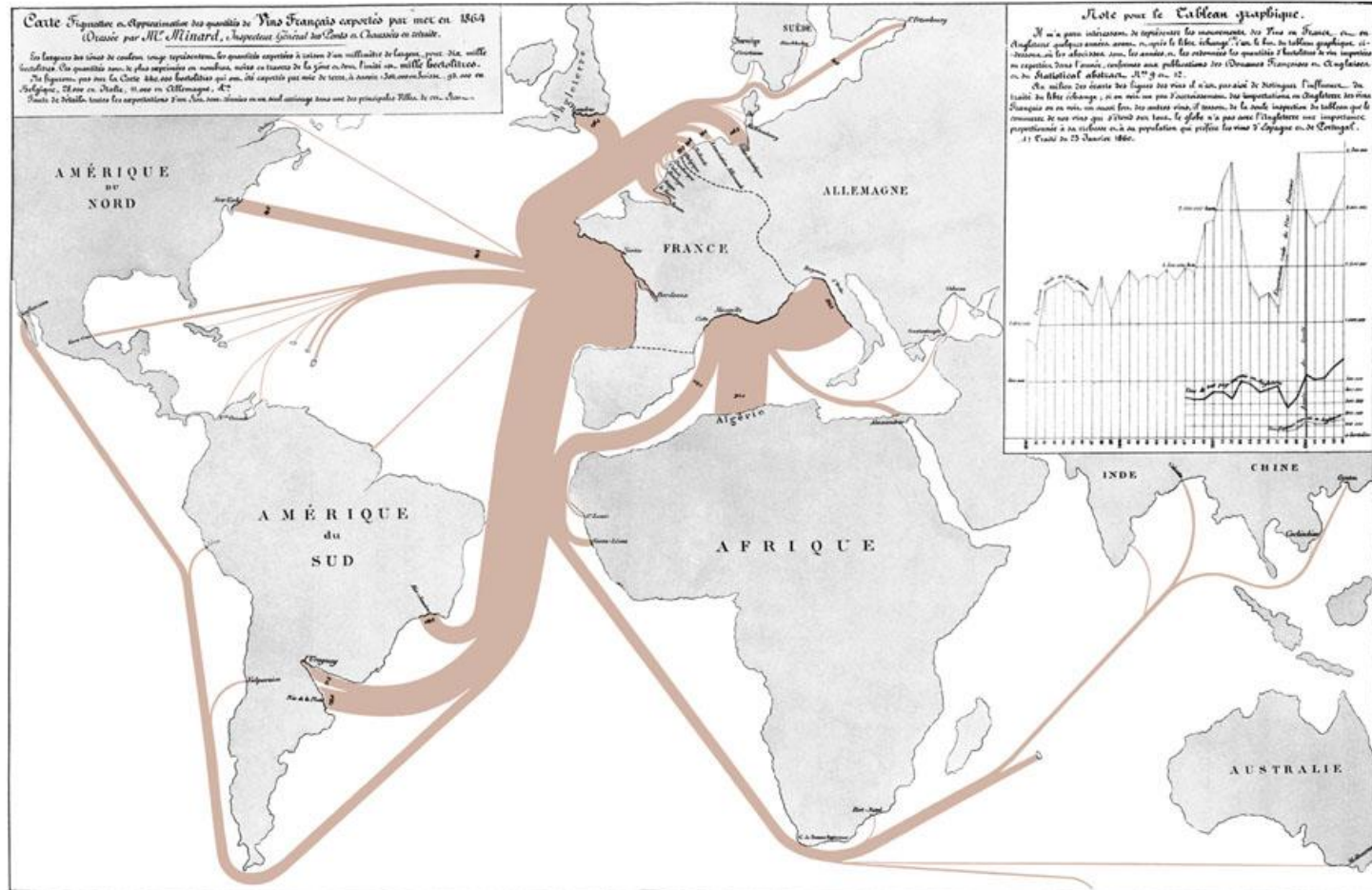
[wikipedia, R. Hamming]

Pioneers





Pioneers



Charles Joseph Minard, *Tableaux Graphiques et Cartes Figuratives de M. Minard, 1845–1869*, a portfolio of his work held by the Bibliothèque de l'École Nationale des Ponts et Chaussées, Paris.



Pioneers



<http://marchingcubes.org>

Bill Lorensen and Dick Bair (both at Watervliet Arsenal) looking at a Lundy Electronics vector refresh graphics display system. The graphics shows the results of a finite element nodal analysis.



Pioneers

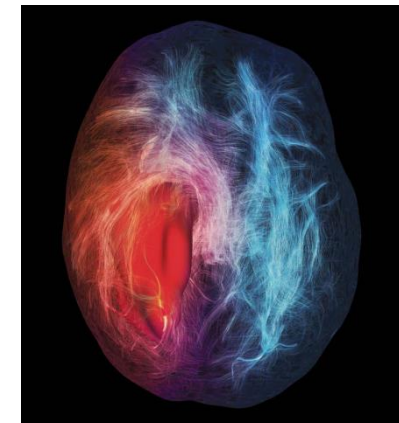


marchingcubes.org:

Shane Chang, Joyce Langan, Will Schroeder, Bill Lorensen, Ken Martin, Margaret Kelliher, October 20, 1994



WHAT IS NOT SCIENTIFIC VISUALIZATION (in this school)

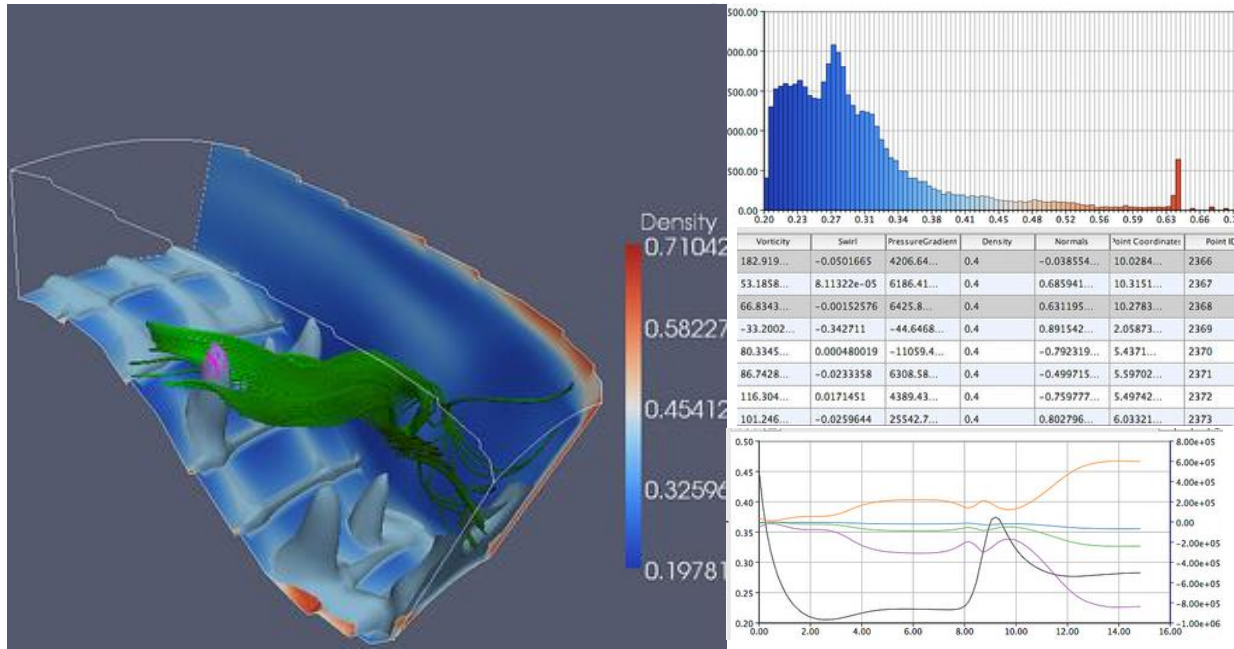


<http://vimeo.com/28776928>

<http://www.sciencemag.org/site/special/vis2012/>



WHAT IS SCIENTIFIC VISUALIZATION (in this school)

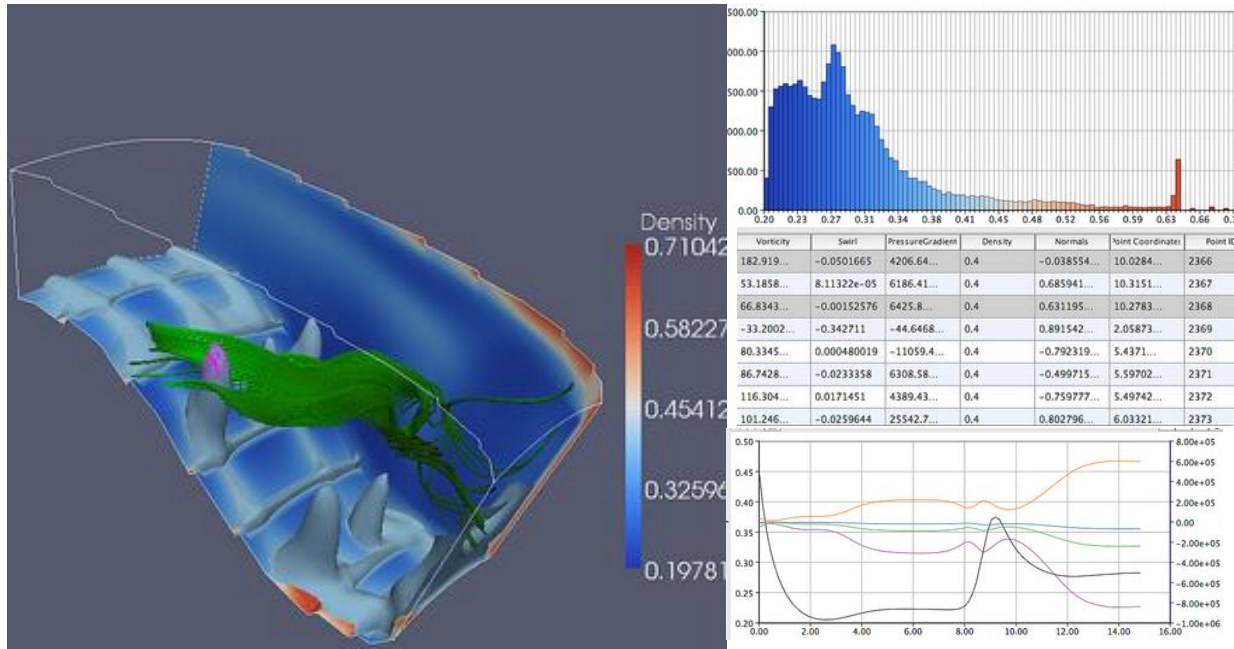


[http://www.ansys.com/
Hall+of+Fame](http://www.ansys.com/Hall+of+Fame)



EXAMPLES

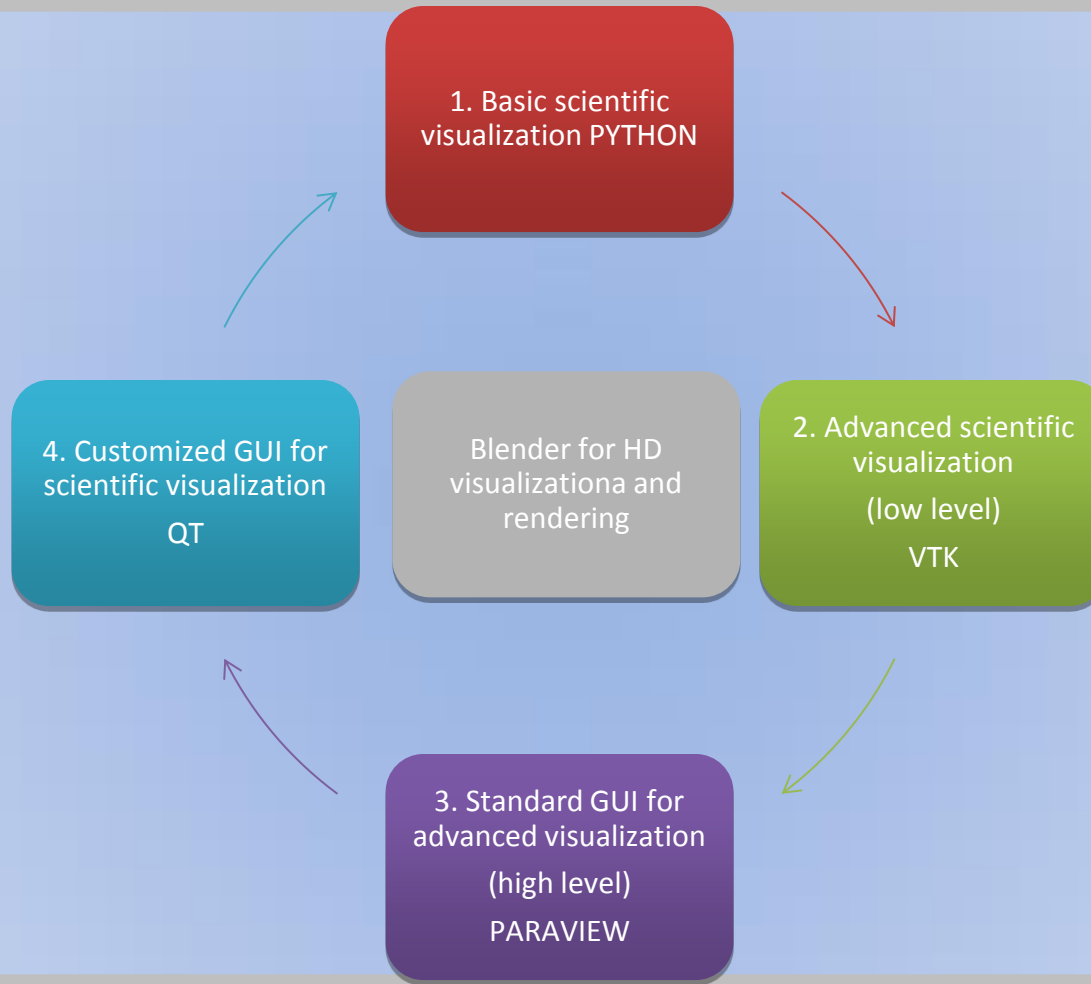
<http://www.kitware.com/solutions/scientificcomputing/scientificcomputing.html>





DECLARED INTENTIONS

Open-source
Cross-platform
Well documented
Python based





TOPICS COVERED BY THE SCHOOL

Topics	
Python for scientific visualization	Basic plotting concepts and tools using Python programming Language
VTK	Introduction to a state-of-the-art scientific visualization library
Paraview	Introduction to a state-of-the-art scientific visualization application with GUI
Qt; Remote Rendering	Introduction to a state-of-the-art library to build GUI (Qt) using the Python programming Language; Remote Rendering services at CINECA
Scientific Visualization in bio-CFD and External Aerodynamics CFD applications	Case history on specific real-life applications: <ul style="list-style-type: none">- bio-CFD- CFD aerodynamics
Blender	High quality visualization & rendering