Florian DE VUYST

Professor in
Computational Science and Numerical Analysis

Born in Paris, the 06/06/1967 (40 years old)
French nationality
Married, two children

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HIGHER EDUCATION AND DIPLOMA

2002	Post-doctoral degree : Authorized to supervise Research and doctoral studies (french HDR diploma)
1994	PhD diploma in Applied Mathematics "Numerical simulation of nonequilibrium hypersonic reactive flows", University Paris 6, LJLL Laboratory and french Office of Aerospace Research (ONERA)
1990	Master Sc. Degree in Numerical Analysis, Paris 6, LJLL Laboratory

WORK EXPERIENCE

2002-2007 (current work)	Professor, permanent position, Ecole Centrale Paris Co-director of the Applied Mathematics Laboratory (ECP) Permanent Associate Researcher position in CMLA Ecole Normale de Cachan
2000-2002	Delegation for company setup, specialized in service for enterprise workflow modeling
1996-2000	Associate professor, Université de Cergy-Pontoise, France
1994-1996	Postdoctoral position, Paris 6, France
1992-1993	Scientific military serviceman, DASSAULT AVIATION, Saint Cloud, France
1990	Associate researcher in the french Office of Aerospace Research (ONERA) PhD candidate.
1990	Masters Sc. in Numerical Analysis. Six-month intership in MICHELIN

RESEARCH TOPICS

- Numerical Fluid Mechanics and Two-phase flow modelling
- Reduced-order modelling for design analysis and optimization
- Mathematical biology modelling applied to cancer migration and proliferation
- Road traffic network modelling: data models and mathematical models
- Uncertainty propagation modelling

DOCTORAL STUDIES DIRECTION

- **Dr. Solène Le Bourdiec**, « Numerical simulation of van Allen radiation belts in Earth magnetosphere », in collaboration with the French Nuclear Energy Agency, defended (2007).
- **Dr. Pascal Jaisson**, Complex systems governed by fluxes: Finite Volume schemes and numerical optimization », defended (2006).
- **Dr. Michaël Ndjinga**, « Mathematical and numerical analysis of mutiphase multifield models », in collaboration with the French Nuclear Energy Agency, defended (2007).
- **Dr. Lucie Fréret**, « Particle methods for the simulation of thermoplastics injection moulding », defended (2007).
- **Dr. Cédric Enaux**, « Mathematical Analysis and numerical analysis of an interpenetrating plasma model », in collaboration with the French Nuclear Energy Agency, defended (2007).
- **Mr. Marc Joliveau**, « Spatiotemporal pattern extraction from urban road traffic networks », to be defended in May 2008**.**
- **Mr. Takuya Kuwahara**, "Characterization of gas-liquid two-phase flow regimes using magnetic fluid: setup, measurements, signal processing and data analysis", Joint PhD under "cotutelle agreement" between Doshisha University and Ecole Centrale Paris, to be defended in January 2008.
- **Mr. Romain Billot**, "Study of the impact of the weather on road traffic: data analysis and dynamic multiscale models", Joint PhD with the French Transportation Research Institute INRETS, Lyon, FRANCE, started in 2007, to be defended in 2010.

POST-DOCTORAL STUDIES DIRECTION

- **Fatima Daim**, « Hybrid deterministic-hybrid numerical optimization for design problems », ECP (2005)
- **Christophe Audouze**, « Metamodeling techniques in Fluid Mechanics for MultiDisciplinary Optimization », ECP (2006)
- **Christophe Audouze, «** Parallel-in-time algorithms. Application to the numerical simulation of stochastic biological clock systems", ECP (2007)

EDUCATION

- General Mathematics, especially Analysis
- Numerical Analysis : differential equations, Partial differential equations, discretization methods, approximation theory, estimation theory
- Data analysis
- Fluid Mechanics : compressible fluids, hyperbolic systems, turbulence
- Scientific computing
- Programming languages for Scientific Computing (Matlab, Scilab, Fortran90, C++, Python/Numpy/Matplotlib, MPI)

OTHER RESPONSABILITIES IN ECOLE CENTRALE PARIS

- Professor in Applied Mathematics
- In charge of the team named “DORA”: dimensionality reduction, optimization, model reduction and data assimilation.
- In charge of several Masters Science degrees in Applied Mathematics: scientific computing, learning, computer vision, modelling and simulation
- Head of a joint laboratory with the French Nuclear Energy Agency
- Member Category A of internal promotion committee for ECP
- Head of a joint Research program between Ecole Normale Supérieure de Cachan, Université Paris Sud – Orsay and Ecole Centrale Paris in High Performance Computing.

RECENT INVITED LECTURES

- Invited Lecturer in the CEA-EDF-INRIA School on Model Reduction, Institut National de Recherche en Informatique et Automatisme INRIA, Rocquencourt, France (2007) : http://www.inria.fr/actualites/colloques/cea-edf-inria/2007/reducmodeles/

- Invited Lecturer at the French Research Institute of Transportation and Security INRETS, Conference on Datawarehousing for Transportation, Arcueil, France (2006)

- Invited Lecturer in the Summer School OCET “Optimisation and control of flows and transfers”, Batz-sur-mer, to come, France (2008) : http://ecoleocet.limsi.fr/

INDUSTRIAL COLLABORATION

- French Nuclear Energy Agency CEA
- Dassault-Aviation
- EADS
- Renault
- Electricité de France
- ENI (Italian Petroleum company)

ACADEMIC COLLABORATION

- Doshisha University, Dept of Mechanical Engineering, Kyoto, Japan
- Ecole Normale Supérieure de Cachan, CMLA (as associate researcher)
- Université Paris Sud Orsay, Dept. of Mathematics
- Université Paris Sud Orsay, Institut Curie (biology institute)
- Ecole Supérieure d’Electricité Supélec, Saclay
- Université Paris Dauphine, Dept. of Computer Science
- Université Paris 6
- Research Institute on Transportation and Safety INRETS, Lyon

NATIONAL AND INTERNATIONAL PROJECTS

- Coordination of the joint Research program between ENS Cachan U. Orsay and ECP (permanent)
- Programme Hubert Curien – France – Japan Sakura Program between Doshisha University and Ecole Centrale Paris (submitted, 2008)
- "Carnot Institute" between Ecole Supérieure d'Electricité and ECP on cancer modelling: migration and proliferation (2007)
- National Research Program "High-Performance Computing", project on uncertainty modelling (2007)
- National Research Program "High-Performance Computing", project on parallel-in-time algorithms (2006)
- National Research Program "Software Technologies" on MultiDisciplinary Optimization (2005)
- Pôle de Compétitivité System@atic, IOLS, Infrastructures and tools for high-performance computing, project (2005)
- Project manager of the National Research Program "Masses of Data" : data acquisition, datawarehousing and dynamical prediction models of urban road traffic networks (2003)

SEMINAR AND CONFERENCE ORGANIZATION

- Organizer and coordinator of the Research working group « RedOpt » on model reduction techniques and optimization, Ecole Centrale Paris
- Full organizer of the international conference "Trends in physical and numerical modelling on two-phase flows in industry", Cargèse CNRS Scientific Institute, Cargèse, Corsica, 50 members, 10 countries represented (September 2003)

Publications 2006 – 2998

François ALOUGES, Florian DE VUYST, Gérard LE COQ and Emmanuel LORIN, "The reservoir technique : a way to make Godunov-type schemes zero or very low diffusive. Application to Colella-Glaz solver", European Journal of Mechanics-B / Fluids, accepted (2008).

Marc JOLIVEAU et Florian DE VUYST, Recherche de motifs de cas atypiques pour le trafic routier urbain, Actes de la conférences Extraction et Gestion de Connaissances EGC 2008, Sophia-Antipolis (2008). **Best applicative paper, EGC 2008, récompense de 1500€**.

Christophe AUDOUZE, Fatima DAIM, Florian DE VUYST, Pascal LAURENT and Ioane MUNTI TOKE, The parareal algorithm as time domain decomposition method. Applications in Finance and Biology, chapter in Domain Decomposition Methods: Algorithms and Practice, F. Magoulès eds, Saxe Coburg Publications, UK, to appear (2008).

Christophe AUDOUZE and Florian DE VUYST State of the art in physics-based metamodeling for computational fluid dynamics problems, Journal of Shanghai University, accepted (2008).

Pascal JAISSON and Florian DE VUYST, Data assimilation and inverse problem for fluid traffic flow models and algorithms, IJNME, accepted (2008).

Takuya KUWAHARA, Florian DE VUYST and Hiroshi YAMAGUCHI, “Flow Regime Classification in Air-Magnetic Fluid Two-Phase Flow”, *Journal of Physics: Condensed Matter*, in press (2008)

Takuya KUWAHARA, Hiroshi YAMAGUCHI and Florian DE VUYST, “Flow Regime Discrimination Technique for Gas-Liquid Two-Phase Flow in Magnetic Fluid”, *Journal of Mechanical Engineering Science, Proceedings of IMechE Part C*, in press (2008)

Takuya KUWAHARA, Hiroshi YAMAGUCHI and Florian DE VUYST, “Measurement of Bubble Velocity in Air-Magnetic Fluid Two-Phase Flow for Slug-Churn Flows”, *Progress in Multiphase Flow Research* II , Japanese Society for Multiphase Flow, pp.133-140, April 2007.

Marc JOLIVEAU and Florian DE VUYST "Space-Time summarization of multisensor time series. Case of missing data", accepted to the Proceedings of 2007 International Workshop on Spatial and Spatio-temporal data mining, IEEE ICDM, Omaha, NE, USA (2007)

Florian DE VUYST and Christophe AUDOUZE, Physics-based metamodeling for parameterized PDE problems using space-parameter space principal component analysis, Lecture Notes, CEA-EDF-INRIA School, Model Reduction: theory and Applications, october 8-10, 2007 - INRIA Rocquencourt, France (2007)

Hiroshi YAMAGUCHI, Takuya KUWAHARA, Shinsuke MATSUMOTO, Masaki SORANO and Florian DE VUYST, “Bubble Velocity Measurement in Gas-Liquid Two-Phase Flow of Magnetic Fluid”, Japan Society of Magnetic Fluid Research Annual Meeting 2006, Hokkaido, December 7-8, 2006, pp.35-36.

Hiroshi YAMAGUCHI, Takuya KUWAHARA and Florian DE VUYST, “Corresponding Waveform of Induced Electromotive Force and Flow Regime of Air-Magnetic Fluid Two-Phase Flow in Electromagnetic Induction Measuring Method”, Japanese Society for Multiphase Flow Annual Meeting 2007, Hokkaido, June 22-24, 2007, pp.60-61.

Takuya KUWAHARA, Hiroshi YAMAGUCHI and Florian DE VUYST, “Flow regime identification for air and magnetic fluid flow using electromagnetic induction and artificial neural network”, Japan Society of Magnetic Fluid Research Annual Meeting 2007, Nagoya, December 6-7, 2007, pp.62-65.

Michael NDJINGA, Anela KUMBARO, Pascal LAURENT and Florian DE VUYST, "Fast computation of the absolute value of a matrix. Application to Roe solver for the numerical simulation of two-phase flow models", Proceedings of International Conference on Nuclear Engineering ICONE 14, **ICONE AWARD, Best European paper**, paper ICONE14-89817 (2006).

Solène LE BOURDIEC, Florian DE VUYST and Laurent JACQUET, Numerical solution of the Vlasov-Poisson system using generalized Hermite functions, Comput. Phys. Comm., Volume 175, Issue 8, pages 528-544 (2006)

D. LUCOR, Cédric ENAUX, H. JOURDREN and P. SAGAUT, Stochastic design optimization: application to reacting flows, Comput. Methods Appl. Mech. Engrg. 196, pp.5047-5062 (2007).

Michael DUMBSER, Cédric ENAUX and Euleterio TORO, Finite volume schemes of very high order of accuracy for stiff hyperbolic balance laws, Journal of Computational Physics, in press (2008).

Hiroshi YAMAGUCHI, Takuya KUWAHARA and Florian DE VUYST, “Corresponding waveform of induced electromotive force and flow regime of air–magnetic fluid two-phase flow in electromagnetic induction measuring method”, *Progress in Multiphase Flow Research* III , Japanese Society for Multiphase Flow, in submission (2008)

Christophe AUDOUZE and Florian DE VUYST, Analysis of a nonintrusive reduced-order model for linear partial differential equation problem, submitted to CRAS, Série I Mathématiques (2008).

Florian DE VUYST, Sensitivity analysis under uncertainty of a linear heat problem and nonintrusive reduced-order model, submitted to CRAS Série I Mathématiques (2008).

Christophe AUDOUZE, Florian DE VUYST and Prasanth NAIR, Reduced-order modeling of parameterized PDEs using time-space-parameter principal component analysis: Part I, International Journal of Numerical Methods in Engineering, submitted (2008).