David IMBERT

Senior C++ developer, PhD
HPC expert and solver architect

Professional experience

CFD software developer & architect, *Airbus*, Toulouse, FR (Sept. 2023 – present) **HPC industrial aerodynamic simulation**
- **Streamline** code review process by **reducing 30%** of unnecessary code
- **Align C++** standards to ensure **scalable** and **maintainable** solutions

Senior C++/CUDA developer, *IMS Nanofabrication*, Vienna, AT (June 2019 – April 2023) **HPC datapath of mask writer tools**
- **Enhance** the **C++17** driver of IMS' *MBMW* multi-beam mask writers
- **Increase CPU** usage in **embedded clusters** by **parallelizing** the parser
- **Optimize** Nvidia Tesla **GPU** memory usage of **concurrent** kernels
- Introduce **InfiniBand** and **CUDA** adapters

HPC software engineer, *Nextflow Software*, Nantes, FR (Aug. 2016 – Apr. 2019) **Design and develop a HPC solver framework**
- **Lead** the redesign a of **parallelized** solver (with MPI) into an **object oriented** one using **C++14** and standardized components: I/O, HPC, maths
- **Optimize** the computation kernel in collaboration with *Intel*
- Co-PI of PASC project on **exascale**

Research engineer, *French Atomic Energy and Alternative Energies Commission – CEA*, Paris Region, FR (Oct. 2014 – Aug. 2016)
HPC simulation of tsunamis: benchmarks and uncertainties
- **Develop** the **C++/MPI** tsunami simulation code (FDTD method) of the **tsunami warning centre** (CENALT)
- **Multiply by 9** performances through a new solver-oriented design
- Conduct **uncertainty** and **sensitivity** analysis for tsunami water heights

Engineer / PhD student, *French National Center for Scientific Research – CNRS, Institute of Physics*, Rennes, FR (Oct. 2010 – Dec. 2013) **Model acoustic properties of submerged granular media**

Trainee engineer, *ARMINES*, Fontainebleau, FR (Mar.–Sept., 2010)
3D finite-differences for seismic imaging of complex structures

Trainee engineer, *University of Rennes 1, IRMAR* (May–July, 2009)
Ultrasonic data inversion to characterise heterogeneous welds

Personnel projects (2018 – 2024)
- **Decompilation** of a Game Boy Advance ROM into C language (2022)
- Portfolio optimization in **quantitative finance**
- **Machine learning** for individualized job offer search

Education

"Doctorat" in Physics *(equiv. of PhD)*, *University of Rennes 1*, France (2010–2013) **Acoustic wave propagation through a suspension of submerged movable grains**
Master in Mechanics and Engineering Science, *University of Rennes 1*, France (2008–2010) **Modelling & Scientific Computing**
"Licence" in Physics *(equiv. of Bachelor's degree)*, *University of Nantes*, France (2005–2008)

CppCon 2023 online sessions, *YouTube* (Summer 2024)
Machine learning for trading, *Udacity* (April 2018)
Advanced C++14 training, *Numscale* (4 d. in 2017)
Uncertainties in scientific computing, *ENS/CEA/EDF* (5d. in 2016)

Additional skills

Language

French	Mother tongue
English	Fluent
German	Beginner
Japanese	Beginner

I. T.

Programming languages	**C++**, **Python**, Fortran, Bash, R, x86
Portability	**STL**, **Boost**, pybind11
Parallel prog.	**CUDA**, OpenMP
Networking	**InfiniBand**, **MPI**, RPC
Profiling	**Intel VTune**, **Valgrind**, **Nvidia** visual profiler
Debugging	**GDB**, Intel Inspector
AI	**ChatGPT**
Code management	**Git**, **Gerrit**, Github, JIRA, Jenkins
Object	UML, design patterns
Compiler	GCC, Intel, Clang
Build & test	CMake, GTest, Catch2
Scientific	numpy, pandas, sklearn, pytorch, matplotlib
Office	PowerPoint, Excel, Latex
OS	**Linux**

Personal information

- Frenchman (37 years old)
- I demonstrate strong **analytical** mindset, **adaptability** and **independence**
- Naturally **curious** and **open-minded**, I am interested in a wide range of subjects
- Full driver's license

Communicate and convince

- **Write articles** in scientific papers
- **Communicate** results in **international** conferences and workshops
- **2 awards** of best scientific posters
- **Review** of code, articles, reports

Side responsibilities

- **Organize** seminars (*IPR*) and weekly design & architecture meetings (*IMS*)
- **Elected representative** of non-permanent researchers at IPR council

Personal data and references available on request –
www.david.imbert.free.fr

Main publications & communications

D. Guerrera, R. M. Cabezón, J.-G. Piccinali, A. Cavelan, F. Ciorba, D. Imbert, L. Mayer, and D. Reed. Towards a mini-app for smoothed particle hydrodynamics at exascale. In *2018 IEEE International Conference on Cluster Computing (CLUSTER)*, Belfast, United Kingdom, September 2018. IEEE.

D. Violeau, R. Ata, M. Benoit, A. Joly, S. Abadie, L. Clous, M. Martin Medina, D. Morichon, J. Chicheportiche, V. Hergault, M. Le Gal, A. Frère, A. Gailler, D. Imbert, A. Loevenbruck, M. Kazolea, M. Ricchiuto, A. Lemoine, S. Le Roy, R. Pedreros, K. Pons, R. Marcer, and R. Silva Jacinto. A database of validation cases for tsunami numerical modelling. Liège, Belgique, July 2016. IAHR.

D. Imbert, E. Antoshchenkova, A. Gailler, and H. Hébert. Uncertainty on seismic sources and bathymetry for tsunami modelling. Prague, République Tchèque, July 2015. IUGG. Communication orale.

D. Imbert, S. McNamara, and Y. Le Gonidec. Fictitious domain method for acoustic waves through a granular suspension of movable rigid spheres. *J. Comput. Phys.*, 280:676–691, 2015.

D. Imbert. *Propagation d'ondes acoustiques dans une suspension de grains mobiles immergés : couplage de modèles discret et continu par la méthode des domaines fictifs*. Thèse de doctorat, Université de Rennes 1, 2013.

D. Imbert, Y. Le Gonidec, and S. McNamara. A numerical method for sound waves in a submerged granular medium. In G. W. Siong, L. S. Piang, and K. B. Cheong, editors, *Proceedings of the 2013 International Congress on Ultrasonics*, page P0338, Singapour, May 2013. 2013 ICU, Research Publishing. Communication orale.

D. Imbert and S. McNamara. Fictitious domain method to model a movable rigid body in a sound wave. *J. Numer. Math.*, 20(3–4):267–285, 2012.

D. Imbert. Modélisation de grains diffusant dans un fluide. Rennes, January 2012. Journée des doctorants de l'école doctorale SDLM. Poster.

D. Imbert and S. McNamara. A distributed Lagrange multiplier based / fictitious domain method to model acoustic wave propagation in granular media in a fluid. Paris, December 2011. 3rd Workshop on Generic Solvers for PDEs: FreeFem++ and Applications. Communication orale.

D. Imbert. Modélisation des propriétés acoustiques des milieux granulaires immergés. In *Actes de la 2e Journée Scientifique des Jeunes Chercheurs*, pages 49–50, Rennes, June 2011. Institut National des Sciences Appliquées. Poster.

D. Imbert, K. Imadoueddine, P. Thierry, H. Chauris, and L. Borges. Tips and tricks for finite difference and i/o-less FWI. In *SEG Technical Program Expanded Abstracts 2011*, pages 3174–3178, San Antonio, Texas, USA, 2011. SEG International Exposition and 81th Annual Meeting.