

Survey

This survey is carried out within the scope of the article in preparation "**Programming Languages for Data-Intensive HPC Applications: a Systematic Mapping Study**", initiated by **Vasco Amaral** (Univ. Nova de Lisboa) and co-authored by the 19 contributors to the SLR/SMS study during the last 3 years.

For complementation and validation of the literature review results, we would like to compare with the honest estimations of **experts** in data-intensive high-performance computing (that is, **you**). Please help us in collecting a sufficiently large and broad statistical basis for this validation by answering this survey form now at the Las Palmas meeting. It only takes 2-3 minutes, and the collected data will enable us to complete the article, producing a tangible outcome of *cHiPSet*.

Please hand in the paper anonymously to **Christoph Kessler** or **Peter Kilpatrick** during the Las Palmas meeting. Many thanks in advance!

1. Were you involved in the SMS (Vasco's literature review program)?

☒ Yes ☐ No

2. How long have you been working in High Performance Computing?

☐ Not at all ☐ < 2 years ☐ 2 to 5 years ☐ 5 to 10 years ☒ > 10 years

3. In what areas of science or engineering have you worked?

(e.g., computer science, bioinformatics, material science, telecommunications ...)

computer science

4. Do your High Performance Computing related activities consist primarily of

☒ Developing programming support tools, or ☐ Using existing programming tools?

5. How do you rate your level of technical knowledge about languages/frameworks for HPC?

☐ Very Poor ☐ Poor ☐ Neutral ☒ Good ☐ Excellent

6. Which programming languages do you use for High Performance Computing?

C, MPI, OpenMP, OpenACC, CUDA, OpenCL, Chapel

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)?
(this may include language properties, performance, programmability, etc.)

control, performance, stability, flexibility

8. What *actually* made you use these languages? (if not already covered in 7.)

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

MPI, OpenMP, OpenACC, CUDA, OpenCL

(relation to question 6 is unclear to me)

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

SAC, S-Net, X10, Hadoop, Spark, Tez, SkePU,
Muesli, skeletons in general, BSP, FastFlow, gph,
StarPU, omps, TensorFlow, Manticore, etc

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6. Which programming languages do you use for High Performance Computing?

mainly Mathematica (www.w.uadfran.com/), Python

7. What are, in your view, the key advantages of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

easy coding, easy prototyping the problem, connections to CUDA and OpenCL

8. What actually made you use these languages? (if not already covered in 7.)

I am using Mathematica for 15 years, easy to prototype fast code HPC

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

X

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

X

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COMPUTER SCIENCE

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☐ Very Poor ☐ Poor ☒ Neutral ☐ Good ☐ Excellent

6. Which programming languages do you use for High Performance Computing?

C, C++

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

PERFORMANCE, PORTABILITY, PROGRAMMABILITY

8. What *actually* made you use these languages? (if not already covered in 7.)

SEE 7

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

NONE

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

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COMPUTER SCIENCE, BIOINFORMATICS, SYSTEMS BIOLOGY, COMP. BIOLOGY.

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5. How do you rate your level of technical knowledge about languages/frameworks for HPC?

☐ Very Poor ☐ Poor ☐ Neutral ☒ Good ☐ Excellent

6. Which programming languages do you use for High Performance Computing?

C, C++, CUDA, PYTHON

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

PERFORMANCE, AVAILABILITY, PORTABILITY

8. What *actually* made you use these languages? (if not already covered in 7.)

SEE 7

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

MPICH2

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

OPENCL

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☐ Very Poor ☐ Poor ☒ Neutral ☐ Good ☐ Excellent

6. Which programming languages do you use for High Performance Computing?

Java, Scala, python, C++

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

python - simple, high level of abstraction, many tools and libraries / Scala - hadoop and spark integration, functional approach

8. What *actually* made you use these languages? (if not already covered in 7.)

most popular -> tutorials etc.

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

tensorflow, open CL, Keras, Elastic Search

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

Skoon, Cassandra, CUDA, Cpu App

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computer science, telecommunications

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☐ Very Poor ☐ Poor ☐ Neutral ☒ Good ☐ Excellent

6. Which programming languages do you use for High Performance Computing?

C, C++, Java

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

C, C++ - low level programming (speed), performance
Java - language properties, popularity

8. What *actually* made you use these languages? (if not already covered in 7.)

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

OpenMP, MPI, CUDA, OpenACC

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

Cassandra, Hougho, Hadoop, OpenCL

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computer science, telecommunication
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5. How do you rate your level of technical knowledge about languages/frameworks for HPC?
☐ Very Poor ☐ Poor ☐ Neutral ☒ Good ☐ Excellent
6. Which programming languages do you use for High Performance Computing?
Python, C++
7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)?
(this may include language properties, performance, programmability, etc.)
Easy tool, large library with a lot of frameworks
Python → logical (based on math. logic) language grammar
8. What *actually* made you use these languages? (if not already covered in 7.)
Popular language for machine learning → Python
9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?
Reckas, Keras
10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?
Erlang (developed by Erlang Solutions)

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☐ Very Poor ☐ Poor ☒ Neutral ☐ Good ☐ Excellent

6. Which programming languages do you use for High Performance Computing?

Python, C++, R

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

a lot of ready to use libraries, high performance

8. What *actually* made you use these languages? (if not already covered in 7.)

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

Pandas, Keras, TensorFlow, scikit, FastFlow

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

Matlab, Java, Erlang

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MATHEMATICS & COMPUTER SCIENCE

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6. Which programming languages do you use for High Performance Computing?

JAVA, PYFLOW

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

These are the most user-friendly

8. What *actually* made you use these languages? (if not already covered in 7.)

Because they are widely used framework or tensorflow

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

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None

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Artificial Intelligence, Artificial Life
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- Which programming languages do you use for High Performance Computing?
—
- What are, in your view, the key advantages of these languages (in relation to the alternatives you know)?
(this may include language properties, performance, programmability, etc.)
—
—
- What actually made you use these languages? (if not already covered in 7.)
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- Which other programming frameworks (e.g., library-based) and tools do you use for HPC?
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Computer sciences

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☐ Very Poor ☐ Poor ☐ Neutral ☐ Good ☒ Excellent

6. Which programming languages do you use for High Performance Computing?

OpenMP, MPI, CUDA, OpenCL

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

OpenMP - shared memory MPI - distributed memory

CUDA - efficiency for NVIDIA GPU, OpenCL - programmability for heterogeneous system.

8. What *actually* made you use these languages? (if not already covered in 7.)

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

PAPI for performance evaluation

PIPS - our interprocedural parallelizer for Fortran77 and C

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

OpenCV, SYCL (C++), Charm++ (C++), OpenACC

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gold computing
BOINC
Statistical genetics
molecular modeling

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5. How do you rate your level of technical knowledge about languages/frameworks for HPC?

☐ Very Poor ☐ Poor ☒ Neutral ☐ Good ☐ Excellent

6. Which programming languages do you use for High Performance Computing?

R, C/C++, BASH, increasingly Python

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

Close to application, community "fashion"

8. What *actually* made you use these languages? (if not already covered in 7.)

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

BOINC

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

MPI, PVM as HPC is mostly cluster computing for me
Vendor's libraries for graphic cards

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computer science, computational intelligence

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6. Which programming languages do you use for High Performance Computing?

C++, R, BASH, Python, Java, assembly, CUDA (instruction set)

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

RELIABILITY and EFFICIENCY

8. What *actually* made you use these languages? (if not already covered in 7.)

SPEEDUP OF EXECUTION AND DEVELOPMENT

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

MPI, OpenMP, Hadoop, SLURM, Hadoop, Docker

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Azure

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(e.g., computer science, bioinformatics, material science, telecommunications ...)

Software Development, VR/AR Simulations

4. Do your High Performance Computing related activities consist primarily of

☒ Developing programming support tools, or ☒ Using existing programming tools?

5. How do you rate your level of technical knowledge about languages/frameworks for HPC?

☒ Very Poor ☐ Poor ☐ Neutral ☐ Good ☐ Excellent

6. Which programming languages do you use for High Performance Computing?

Python

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

Easy Programming, Performance

8. What *actually* made you use these languages? (if not already covered in 7.)

Knowledge

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

Oracle, Java, C++

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

Survey

This survey is carried out within the scope of the article in preparation "**Programming Languages for Data-Intensive HPC Applications: a Systematic Mapping Study**", initiated by **Vasco Amaral** (Univ. Nova de Lisboa) and co-authored by the 19 contributors to the SLR/SMS study during the last 3 years.

For complementation and validation of the literature review results, we would like to compare with the honest estimations of **experts** in data-intensive high-performance computing (that is, **you**). Please help us in collecting a sufficiently large and broad statistical basis for this validation by answering this survey form now at the Las Palmas meeting. It only takes 2-3 minutes, and the collected data will enable us to complete the article, producing a tangible outcome of *cHiPSet*.

Please hand in the paper anonymously to **Christoph Kessler** or **Peter Kilpatrick** during the Las Palmas meeting. Many thanks in advance!

1. Were you involved in the SMS (Vasco's literature review program)?
☐ Yes ☒ No
2. How long have you been working in High Performance Computing?
☒ Not at all ☐ < 2 years ☐ 2 to 5 years ☐ 5 to 10 years ☐ > 10 years
3. In what areas of science or engineering have you worked?
(e.g., computer science, bioinformatics, material science, telecommunications ...)
Theoretical computer science (math. logic)
4. Do your High Performance Computing related activities consist primarily of
☒ Developing programming support tools, or ☒ Using existing programming tools?
5. How do you rate your level of technical knowledge about languages/frameworks for HPC?
☐ Very Poor ☒ Poor ☐ Neutral ☐ Good ☐ Excellent
6. Which programming languages do you *use* for High Performance Computing?
—
7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)?
(this may include language properties, performance, programmability, etc.)
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8. What *actually* made you use these languages? (if not already covered in 7.)
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(e.g., computer science, bioinformatics, material science, telecommunications ...)

Computer Science

4. Do your High Performance Computing related activities consist primarily of

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5. How do you rate your level of technical knowledge about languages/frameworks for HPC?

☐ Very Poor ☐ Poor ☐ Neutral ☒ Good ☐ Excellent

6. Which programming languages do you use for High Performance Computing?

Scala, Python

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

Framed within environment

8. What *actually* made you use these languages? (if not already covered in 7.)

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

Jinc

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

C, C++

Survey

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☐ Very Poor ☐ Poor ☒ Neutral ☐ Good ☐ Excellent

6. Which programming languages do you use for High Performance Computing?

Scala, Java

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

Scala, easy development, performance

8. What *actually* made you use these languages? (if not already covered in 7.)

Previous knowledge

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

Other simulators, proprietary

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

Omnet++ , CloudSim , GridSim

Survey

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3. In what areas of science or engineering have you worked?

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Computational Science

4. Do your High Performance Computing related activities consist primarily of

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5. How do you rate your level of technical knowledge about languages/frameworks for HPC?

☐ Very Poor ☐ Poor ☐ Neutral ☐ Good ☒ Excellent

6. Which programming languages do you use for High Performance Computing?

C/C++ // MPI / FastFlow .

7. What are, in your view, the *key advantages* of these languages (in relation to the alternatives you know)? (this may include language properties, performance, programmability, etc.)

Abstraction

8. What *actually* made you use these languages? (if not already covered in 7.)

9. Which other programming frameworks (e.g., library-based) and tools do you use for HPC?

MPI / FastFlow .

10. Which other HPC programming languages / frameworks / tools do you know about (but do not use)?

OpenMP / PVM .