1. 29 Institutes in Collaboration
2. 775 registered students
3. Notes translated into isiXhosa
4. 24% Hon, 38% MSc, 34% PhD/PostDoc
5. Top 3 domain areas: Physics, Chemistry, & Computer Science
Agenda

- History of CSS
- Redesigning the CSS
- A School of Firsts in SA
- Mini-School Lifecycle
- CHPC Team
- NITheCS Team
- Student Statistics
- Hybrid Learning Stack
- School Structure & Timetable

- Champions & Venue Logistics
- Automated Marking
- Automated Certification
- Prizes
- Feedback
- Monthly Coding Challenge

Coding Summer School (CSS)
History of CSS

- The Coding Summer School (CSS) is an annual event that is done in collaboration between Centre for High Performance Computing (CHPC) and the National Institute for Theoretical and Computational Sciences (NITheCS)
- Before covid – was in person at specific location with an average of 50 postgraduate students
- Aim was to teach postgraduate students python coding, data science, and computational skills
Redesigning the CSS

- During Covid we were fully virtual and we had about 150 students participate.
- Post Covid – to extend the reach we decided to make it hybrid and stream live content at university lecture halls around the country where students attend physically.
- Our initial estimate was 350 students and 5 university venues participating.
- ...we got 773 students and 29 universities and research institutes and participating!!!
CSS Lifecycle

- For this scale of logistics, we needed a lot of planning
- End-to-end
  - Needs Assessment and Design
  - Planning
  - Marketing & Recruitment
  - Execution
  - Monitoring & Evaluation
CHPC Team

- Mr. Binyamin Barsch *(Lead Coordinator/Lecturer)*
- Dr. Werner Janse van Rensburg *(Co-Coordinator)*
- Mr. Mthetho Sovara *(Core Team: Lecturer)*
- Dr. Kevin Colville *(Senior Advisor)*
- Ms. Lara Timm *(Core Team: Logistics + Teaching)*

- Mr. Bryan Johnston *(Canvas Team: Infrastructure)*
- Mr. Eugene de Beste *(Canvas Team: API + Marking)*
- Ms. Nomlie Mfuphi *(Core Team: Translation)*
- Mr. Sam Mathekga *(Core Team: Certificates)*

Coding Summer School (CSS)
NITheCS Team

- Prof. Francesco Petruccione (Coordinator/Lecturer)
- Mrs. Rene Kotze (Logistics Coordinator + Marketing)
- Mr. Aluwani Guga (Core Team: Venue + Champions)
- Ms. Thuthukile Khumalo (Core Team: Venue + Champions)
- Prof. Uwe Jaekel (Lecturer)
- Dr. Graeme Pleasance (Lecturer)
- Prof. Ilya Sinayskiy (Lecturer)
Hybrid Learning Stack

- **Canvas**
  - Learning Management System
  - Online, Ease-of-use, Free, Scalable, API friendly

- **Slack**
  - All communication, each venue has own slack channel

- **Zoom**
  - Used to stream live lesson to all venues

- **MS Planner**
  - Store planning material, create & designate tasks

- **Gitlab**
  - Store material
School Structure

- Started: 30 Jan 2023, Time: 9:00 – 16:00 PM, Ended: 10 Feb 2023
- Students sent login details for slack and how to access the content on the 23 Jan 2023 (1 week before classes start). During this time, they should familiarize themselves with Canvas and install necessary software.
- Champions got access to Canvas and all notes on 23 Jan, students got day 1 notes on the 29 Jan
- Each institute had their own slack channel
- Students expected to be on campus/institute locations – unless affected by loadshedding

Coding Summer School (CSS)
School Structure

• All students expected to be on zoom during the live 30/40min lesson period during the day
• During tutorial sessions – students ask questions, do quizzes and can interact with tutors & students
• Students can ask questions on slack for
• Students expected to install software on their own laptops/PCs – if not browser options can be used
<table>
<thead>
<tr>
<th>Time</th>
<th>Monday - 30 Jan</th>
<th>Tuesday - 31 Jan</th>
<th>Wednesday - 1 Feb</th>
<th>Thursday 2 Feb</th>
<th>Friday - 3 Feb</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Welcoming</td>
<td>Python - Review</td>
<td>Python - Review</td>
<td>Python - Review</td>
<td>Linux - Review</td>
</tr>
<tr>
<td>9:30</td>
<td>Overview of course</td>
<td>Python 5 - Data storage</td>
<td>Python 9 - Data Visualization</td>
<td>Linux 1 - Getting started</td>
<td>Linux 5 - Flags, wildcards &amp; Files Tutorial</td>
</tr>
<tr>
<td>10:00</td>
<td>Introduction to programe</td>
<td>Python 5 - Data storage Tutorial</td>
<td>Python 9 - Data Visualization Tutorial</td>
<td>Linux 1 - Getting started</td>
<td>Linux 6 - Searching, updating &amp; piping</td>
</tr>
<tr>
<td>10:30</td>
<td>Break</td>
<td>Break</td>
<td>Break</td>
<td>Break</td>
<td>Break</td>
</tr>
<tr>
<td>11:00</td>
<td>Python 1 - Introduction</td>
<td>Python 6 - Text &amp; Strings</td>
<td>Python 10 - Scientific Computing</td>
<td>Linux 2 - Terminal &amp; Debugging</td>
<td>Linux 6 - Searching, updating &amp; piping Tutorial</td>
</tr>
<tr>
<td>11:30</td>
<td>Python 2 - Setting Up</td>
<td>Python 6 - Text &amp; Strings Tutorial</td>
<td>Python 10 - Scientific Computing Tutorial</td>
<td>Linux 2 - Terminal &amp; Debugging Tutorial</td>
<td>Linux 7 - Variables, loops &amp; conditionals</td>
</tr>
<tr>
<td>12:00</td>
<td>Python 3 - Basics</td>
<td>Python 7 - Loops &amp; Conditionals</td>
<td>Python 11 - Data Science</td>
<td>Linux 3 - CRUD</td>
<td>Linux 7 - Variables, loops &amp; conditionals Tutorial</td>
</tr>
<tr>
<td>12:30</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
</tr>
<tr>
<td>13:00</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
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<tr>
<td>13:30</td>
<td>Special Topic - Dr Krishna Govender</td>
<td>Special Topic - Dr Andrew Gill</td>
<td>Special Topic - Dr Kevin Colville</td>
<td>Special Topic - Prof. Thinus Booysen</td>
<td>Special Topic</td>
</tr>
<tr>
<td>14:00</td>
<td>Python 3 - Basics Tutorial</td>
<td>Python 7 - Loops &amp; Conditionals Tutorial</td>
<td>Python 11 - Data Science Tutorial</td>
<td>Linux 3 - CRUD Tutorial</td>
<td>Linux 8 - Script Files</td>
</tr>
<tr>
<td>14:30</td>
<td>Python 4 - Scripts &amp; Variables Tutorial</td>
<td>Python 7 - Loops &amp; Conditionals Tutorial</td>
<td>Python 11 - Data Science</td>
<td>Linux 4 - Text editors Tutorial</td>
<td>Linux 8 - Script Files</td>
</tr>
<tr>
<td>15:00</td>
<td>Break</td>
<td>Break</td>
<td>Break</td>
<td>Break</td>
<td>Break</td>
</tr>
<tr>
<td>15:10</td>
<td>Python 4 - Scripts &amp; Variables</td>
<td>Python 8 - Modules &amp; Functions</td>
<td>Python 11 - Data Science</td>
<td>Linux 4 - Text editors Tutorial</td>
<td>Linux 8 - Script Files Tutorial</td>
</tr>
<tr>
<td>15:30</td>
<td>Python 4 - Scripts &amp; Variables Tutorial</td>
<td>Python 8 - Modules &amp; Functions</td>
<td>Python 11 - Data Science Tutorial</td>
<td>Linux 5 - Flags, wildcards &amp; Files</td>
<td>Linux 9 - HPC Intro</td>
</tr>
<tr>
<td>16:00</td>
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## Week 2 - NITheCS - Python Advanced Applications

<table>
<thead>
<tr>
<th>Monday - 6 Feb</th>
<th>Tuesday - 7 Feb</th>
<th>Wednesday - 8 Feb</th>
<th>Thursday - 9 Feb</th>
<th>Friday - 10 Feb</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Introduction to SymPy (1)</td>
<td>Probability Theory and Statistics</td>
<td>Ordinary Differential equations</td>
<td>Partial Differential Equations (1)</td>
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<tr>
<td>10:00</td>
<td>Introduction to SymPy (3)</td>
<td>Probability Theory and Statistics</td>
<td>Ordinary Differential equations</td>
<td>Partial Differential Equations (1)</td>
</tr>
<tr>
<td>10:30</td>
<td>Break</td>
<td>Break</td>
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<td>Break</td>
</tr>
<tr>
<td>11:00</td>
<td>Tutorial</td>
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<tr>
<td>11:30</td>
<td>Tutorial</td>
<td>Tutorial</td>
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<td>Tutorial</td>
</tr>
<tr>
<td>12:00</td>
<td>Tutorial</td>
<td>Tutorial</td>
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<td>Tutorial</td>
</tr>
<tr>
<td>12:30</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
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<tr>
<td>13:00</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
</tr>
<tr>
<td>13:30</td>
<td>Special Topic</td>
<td>Special Topic</td>
<td>Special Topic</td>
<td>Special Topic</td>
</tr>
<tr>
<td>14:00</td>
<td>Linear Algebra with SymPy</td>
<td>Random numbers and Monte Carlo Methods</td>
<td>Differential Equations</td>
<td>Partial Differential Equations (2)</td>
</tr>
<tr>
<td>14:30</td>
<td>Linear Algebra with SymPy</td>
<td>Random numbers and Monte Carlo Methods</td>
<td>Differential Equations</td>
<td>Partial Differential Equations (2)</td>
</tr>
<tr>
<td>15:00</td>
<td>Break</td>
<td>Break</td>
<td>Break</td>
<td>Break</td>
</tr>
<tr>
<td>15:10</td>
<td>Tutorial</td>
<td>Tutorial</td>
<td>Tutorial</td>
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<tr>
<td>15:30</td>
<td>Tutorial</td>
<td>Tutorial</td>
<td>Tutorial</td>
<td>Closing</td>
</tr>
<tr>
<td>16:00</td>
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</tbody>
</table>
Special Topics / STEM Talks

- A break from normal lessons from 13:30 – 14:00
- Senior researchers to discuss their research domains of HPC, STEM, and related fields.

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>STEM Talk - Dr Krishna Govender</td>
<td>STEM Talk - Dr Andrew Gill</td>
<td>STEM Talk - Dr Kevin Colville</td>
<td>STEM Talk - Prof. Thinus Booyse</td>
<td>STEM Talk - Dr Charles Crosby</td>
</tr>
</tbody>
</table>

- 13:30
  - STEM Talk - Mr Bryan Johnston - HPC Ecosystems In Africa + SA
  - STEM Talk - Prof F. Petruccione: Introduction to Quantum Computing
  - STEM Talk - SAMRC - Dr Pritika Ramharack
  - STEM Talk - Ian David, Introduction to Qiskit
  - STEM Talk - Prof Zurab Janelidze, Mathematical Proofs with Python

Coding Summer School (CSS)
Student Statistics

Location Count

- SOL PLAATJE UNIVERSITY
- WALTER SISULU UNIVERSITY
- UNIVERSITY OF KWAZULU-NATAL (PMB CAMPUS)
- DURBAN UNIVERSITY OF TECHNOLOGY
- ITHEMBA LABS
- UNIVERSITY OF ZULULAND
- SEFAKO MAKGATHO HEALTH SCIENCES UNIVERSITY
- UNIVERSITY OF THE FREE STATE
- UNIVERSITY OF VENDA
- RHODES UNIVERSITY
- UNIVERSITY OF THE WITWATERSRAND
- NELSON MANDELA UNIVERSITY
- NORTH-WEST UNIVERSITY
- UNIVERSITY OF LIMPOPO
- ONLINE (OUTSIDE SA)
Student Statistics

Languages

<table>
<thead>
<tr>
<th>Language</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>ISIZULU</td>
<td>23.43</td>
</tr>
<tr>
<td>SEPEDI</td>
<td>21.69</td>
</tr>
<tr>
<td>ISIXHOSA</td>
<td>16.20</td>
</tr>
<tr>
<td>SESOTHO</td>
<td>16.20</td>
</tr>
<tr>
<td>SETSWANA</td>
<td>14.19</td>
</tr>
<tr>
<td>AFRIKAANS</td>
<td>10.98</td>
</tr>
<tr>
<td>TSHIVENDA</td>
<td>8.70</td>
</tr>
<tr>
<td>XITSONGA</td>
<td>7.23</td>
</tr>
<tr>
<td>SISWATI</td>
<td>4.82</td>
</tr>
<tr>
<td>ISNDEBELE</td>
<td>3.35</td>
</tr>
</tbody>
</table>
Student Statistics

Domain Areas

- **PHYSICS**: 23.2
- **CHEMISTRY**: 17.6
- **COMPUTER SCIENCE**: 13.2
- **INFORMATION TECHNOLOGY**: 9.2
- **BIOINFORMATICS**: 7.2
- **BIOCHEMISTRY**: 4.4
- **MICROBIOLOGY**: 3.6
- **APPLIED MATHEMATICS**: 2.8
- **MEDICAL VIROLOGY**: 2.8
- **NUCLEAR PHYSICS**: 2.8
- **MOLECULAR BIOLOGY**: 2.4
- **ASTROPHYSICS**: 2.4
- **HUMAN GENETICS**: 2.4
- **GENETICS**: 2
- **MATHEMATICS**: 2
- **AGRICULTURE**: 2
Student Statistics

Why Take The Course

- TO LEARN MORE ABOUT HPC: 340
- TO LEARN MORE ABOUT DATA SCIENCE: 430
- TO LEARN ABOUT PYTHON: 510
- TO LEARN ABOUT LINUX: 420
- TO HELP WITH MY RESEARCH: 451
- REQUIRED AS PART OF MY STUDIES: 196
- OTHER: 44
- A REFRESHER: 113
Student Statistics

Programming Experience

- PERL: 14
- PYTHON: 349
- OTHER: 89
- MATLAB: 159
- JAVA OR C#: 188
- SPREADSHEETS ONLY: 181
- FORTRAN: 44
- C OR C++: 196
- COBOL: 2
- BASH: 100

Other languages:
<table>
<thead>
<tr>
<th>Superhero</th>
<th>Count</th>
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</thead>
<tbody>
<tr>
<td>IRON MAN</td>
<td>59</td>
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<tr>
<td>SPIDER MAN</td>
<td>51</td>
</tr>
<tr>
<td>WONDER WOMAN</td>
<td>49</td>
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<tr>
<td>BATMAN</td>
<td>44</td>
</tr>
<tr>
<td>SUPERMAN</td>
<td>28</td>
</tr>
<tr>
<td>BLACK PANTHER</td>
<td>19</td>
</tr>
<tr>
<td>CODING SUPER HERO</td>
<td>16</td>
</tr>
<tr>
<td>ME</td>
<td>15</td>
</tr>
<tr>
<td>NA</td>
<td>13</td>
</tr>
<tr>
<td>DR STRANGE</td>
<td>10</td>
</tr>
<tr>
<td>THOR</td>
<td>9</td>
</tr>
<tr>
<td>FLASH</td>
<td>6</td>
</tr>
<tr>
<td>ELON MUSK</td>
<td>5</td>
</tr>
<tr>
<td>DATA SCIENTIST</td>
<td>5</td>
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<tr>
<td>HULK</td>
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</tr>
<tr>
<td>ALBERT EINSTEIN</td>
<td>5</td>
</tr>
<tr>
<td>AQUAMAN</td>
<td>5</td>
</tr>
<tr>
<td>CAT WOMAN</td>
<td>5</td>
</tr>
<tr>
<td>PROFESSOR X</td>
<td>5</td>
</tr>
</tbody>
</table>
Champions & Venue Logistics

• Arrange the venue location that has enough seating, stable internet and power during load shedding (if possible)
  • If capacity is exceeded, preference should be given to students who registered early and others should attend online
• Contact students and confirm their attendance at your specific location
• Arrange for meals for students. NITheCS and CHPC sponsored R50 per student per day
• If possible, arrange for student tutors to help during tutorial sessions
Automated Marking

- Canvas API
- Python Assignment
- Bash Assignment
Automated Certification

About 350 Certificates:

- G-label
- Outlook
- Python Script

Coding Summer School (CSS)
Prizes

One R500 Exclusive Books Gift Voucher per winner

Categories:
1. Top 3 most active students on slack
2. Top 2 champion prizes for the most active venues on slack
3. Top 3 quiz marks

Coding Summer School (CSS)
Coding Summer School - Week 1 - Feedback Form

239 Responses
53:12 Average time to complete
Active Status

View results

1. Venue (Name of Institute or Online)
   More Details

   239 Responses
   Latest Responses
   "VUT"
   "University of Zululand"
   "University of zululand (online)"
Feedback

- Intensive course
- Students are introduced to tools and concepts that can use for their research
- Not intended to be fully comprehensive, that’s the job of the universities
- 2-week period cutoff
- Timing during the year
- 20 – 30 students per venue
Monthly Coding Challenge

- Continued Learning
- Python Data Science Challenges
A School of Firsts in SA...

- Collaboration of 29 research institutes and centres in SA
- Institutes outside SA
- 773 students at a hybrid event
- Coding content translated to isiXhosa
- Diverse group of domain areas
Thank you – any questions?