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**RADIOCOMMUNICATION BUREAU INTERNSHIP REPORT**

**Carlos Fortuny-Lombraña** has completed an internship from **Space Administrative Software Division (SAS)** in the Radiocommunication Bureau (BR), under the supervision of **Olivier Chuzel and Veronica Roman.**

Summary of Internship Experience:

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| **Description of Internship *Tasks and Responsibilities*** |
| The internship opportunity, which is to be undertaken under the supervision of two Senior Software Engineers, is structured in two distinct phases:  The primary objective of the first phase is the modernization of existing calculation routines utilized in engineering and scientific applications by converting them from FORTRAN to C/C++. Specifically, this phase will involve the development of code for determining the minimum elliptical beam of a satellite antenna that encompasses a set of test points on the Earth's surface. The end goal is to create a new version of a Dynamic Link Library (DLL) that maintains a similar interface and functionality as the current FORTRAN version, and will be integrated into the GIMS software for the calculation of the optimal ellipse that encompasses a set of test points.  The second portion of this internship focused on the examination, selection, implementation, evaluation, and incorporation of appropriate Deep Learning techniques for the dispatching of BR correspondences. The project pertains to the automation of the daily correspondences received by the Head of the Space Publication and Registration Division (SPR) that are then forwarded to the relevant Senior Engineer. To begin, a database was created to organize all test cases that would be utilized for supervised training. The next steps were to select and fine-tune the model, train it, and analyze its performance. My role in this part of the internship was primarily to assist another intern by establishing the Python environment and training the datasets. |
| **Overview of internship experience *Description of skills learned and/or developed and accomplishments*** |
| During my 3-month internship at ITU, I had the opportunity to develop and sharpen a variety of skills in the field of software engineering. One of the main skills I developed was code modernization, as I was responsible for converting existing calculation routines from FORTRAN to C/C++. This was my first time diving into FORTRAN, and it has been quite enriching to learn it. I also improved my skills in how to use Microsoft Visual Studio. Specifically, I developed a new version of a Dynamic Link Library (DLL) that maintains a similar interface and functionality as the current FORTRAN version and will be integrated into the GIMS software.  Another important skill I developed was deep learning, which I applied while working on the automation of the daily correspondences received by the Head of the Space Publication and Registration Division (SPR). Here, I had the chance to immerse myself in the field of deep learning by working on a project to automate the daily correspondences received by the Head of SPR. During this project, I familiarized myself with the BERT model of Google and learned how to fine-tune the hyperparameters of a semi-supervised learning model using PyTorch. Furthermore, I also gained knowledge of the process of organizing and labeling emails received by the Head of SPR using dqMan and Documentum.  In addition to developing my skills in software engineering and deep learning, I had the opportunity to gain further knowledge in the telecommunications field through my attendance at the onsite ITU World Radiocommunication Seminar 2022 in Geneva. The seminar, which is held every two years, provided me with valuable insights into the regulations and bureaucracy related to avoiding interference in signals. I also had the chance to experiment with space software such as GIMS and learn more about the frequency bands used for different applications. The seminar was a great opportunity for networking and meeting the ITU team in person. My attendance at the seminar was a significant supplement to my internship experience.  In conclusion, my internship at ITU was a valuable learning experience that has provided me with a broad range of knowledge and practical skills in software engineering and deep learning. Through the modernization of existing calculation routines, the automation of daily correspondences, the attendance at the ITU World Radiocommunication Seminar, and the opportunity to network with the ITU team, I have gained valuable insights and hands-on experience that will be beneficial in my future career. I am grateful for the opportunity to have been part of this valuable internship program and look forward to applying what I have learned in my future endeavors. |

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| **Ongoing Consideration *Additional comments*** |
| Overall, I found the experience of working in an international team to be extremely beneficial. It gave me the opportunity to learn about different cultures from around the world, and the cosmopolitan nature of Geneva was truly impressive. I must highlight that this internship was highly beneficial in terms of improving my skills in software and scripting, which has instilled confidence in me for taking on future software projects and learning new coding languages.  Unpaid internships can provide valuable opportunities, but I respectfully bring attention to the difficulty I faced maintaining focus due to lack of remuneration. Being on-site would have improved my learning experience. I suggest that in the future, ITU allocate a small percentage of its budget towards covering living expenses for interns and move away from unpaid internships. Furthermore, I was lucky enough to be able to cover the expenses for the ITU Seminar, but it is unfortunate that ITU does not provide any financial assistance for transportation or meals for its interns. |

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| Please rate the following on a scale of 1 – 5; (1) Unsatisfactory, (2) Uncomplimentary, (3) Fair, (4) Commendable, (5) Exceptional**:** | **1** | **2** | **3** | **4** | **5** |
| **Onboarding** |  |  |  |  |  |
| Accounts and accesses set-up (email, drives, etc.) |  |  |  |  | **x** |
| Welcome and introduction to the team |  |  | **x** |  |  |
| **Mentorship** |  |  |  |  |  |
| How clearly defined were your tasks and responsibilities |  |  | **x** |  |  |
| How well were you introduced to your tasks (training) |  |  | **x** |  |  |
| Support from supervisors or team members (check-in meetings) |  |  |  | **x** |  |
| Communication with supervisor |  |  | **x** |  |  |
| **Internship Experience** |  |  |  |  |  |
| Opportunity to work independently |  |  |  |  | **x** |
| Opportunity to apply creativity |  |  |  |  | **x** |
| Opportunity to apply expertise |  |  | **x** |  |  |
| Opportunity to learn new skills |  |  | **x** |  |  |
| Networking opportunities |  |  |  |  | **x** |
| How valuable was the Internship |  |  |  | **x** |  |

Date: 13-01-2023 Signature: Carlos Fortuny-Lombraña