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Exploring Technical Challenges in Data Science Fundamentals with Python for First-year Students at a Rural South African University

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Abstract. Most Eastern Cape rural schools operate in a disadvantaged context and are struggling to raise standards. In many rural areas, access to quality education and access to devices or other resources in information technology and computer science may be limited, making such an initiative particularly impactful.

The current state of high schools has a huge impact on students going to universities. As an example, majority of first-year Information Technology Diploma students in the selected University, come from rural schools in the Eastern Cape (EC). Introducing data science with Python to first-year students at the selected university presents an exceptional opportunity to equip students with essential skills for the digital age while addressing the specific challenges of the local context.

In order to extract insights from data, data science is an interdisciplinary field that integrates statistical analysis, machine learning, and domain expertise. It is becoming more and more significant in a variety of global sectors. The university can help first-year students develop the critical thinking and problem-solving abilities necessary for success in the twenty-first century, as well as prepare them for future employment. Python, a useful and beginner-friendly programming language, is complementary for introducing data science concepts to beginner students. It is an ideal choice for introductory courses. Moreover, Python's popularity in both industry and academia ensures that students will acquire skills relevant to their future careers. Practical, hands-on exercises can be incorporated into the course to address the unique requirements and challenges faced by rural students. To guarantee that every student has an equal chance to succeed, the institution can also offer support services like mentoring, tutoring, and access to computer labs and internet resources.

Introducing data science as supplementary content to these first-year students is a challenge for disadvantaged students without this course background and access to devices, resulting in confusion, anxiety and frustration. Many of the students entering the university lack basic computer and digital skills and have no access to devices, in addition to the English language as a medium of instruction used in programming. The paper focuses on some of the best approaches and support tools as well as resources for assisting disadvantaged students, and we reflect on how they have worked out for any given computer programming problem-solving task.

Keywords: Data Science, Programming, Digital Skills, Information Technology

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