

Developing the Workforce of the Future

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ABSTRACT

In an era defined by rapid technological innovation and data-driven-decision-making, statistical programmers (SP) occupy a pivotal role in shaping analytical pipelines. This paper provides strategic guidance to SP seeking to advance their professional trajectories and maximize their impact in the evolving analytics ecosystem. Outlining practical steps for upskilling, emphasizing the importance of mastering foundational languages such as R/Python/SAS and emerging technologies including machine-learning-frameworks/cloud-based-tools/AI-applications. The paper delves into the value of building interdisciplinary communication skills, engaging in open-source-communities, and pursuing relevant certifications. Special attention is given to navigating the shift from legacy ways to modern, collaborative platforms, highlighting opportunities for leadership in adopting reproducible research practices and automation. Through actionable recommendations, illustrating pathways to expand their influence, drive innovation, and foster continuous learning. Ultimately, this paper aims to empower SP with direction and confidence needed to proactively shape their careers, adapt to technological advancements, and remain competitive in a rapidly evolving professional landscape.

INTRODUCTION

In an era defined by rapid technological innovation and data-driven decision-making, Statistical Programmers (SP) can still play a pivotal role in shaping analytical pipelines and driving impactful insights if they are willing to adapt. As artificial intelligence (AI) and machine learning (ML) become central forces in the analytics ecosystem, SP face both unprecedented opportunities and significant challenges. The evolving landscape demands not only technical proficiency but also adaptability, strategic vision, leadership and continuous learning. This paper provides comprehensive guidance for statistical programmers seeking to advance their careers, maximize their contributions, and remain competitive in the fast-changing world of AI and ML. One thing is obvious; the world of SP will not stay the same as we know it today...

“Thriving in the AI era is about the ability to learn quickly and adapt...also unlearn”

Keeping up with Technology:

Mastering Foundational Languages: R, Python, and SAS

Proficiency in foundational programming languages is crucial for statistical programmers aiming to excel in analytics roles. R, Python, and SAS remain industry standards due to their robust libraries, extensive community support, and versatility in handling complex data tasks. You can be proficient in one as your native language and vary at different levels on others. Which one you pick as your native language is based on at what level you are in your career and what your organization is *deploying* as their primary. Numerous resources are available to support your learning and development. The new era of code development is enabled by bots which democratizes the use of programming languages and the use of tools such as Claude enables rapid code and AI agent development. However, it is essential to invest sufficient time to learn and seek opportunities to apply and refine the skills you acquire, in this new age it will be essential that programmers are able to create clear specifications as well as code. As AI usage increases, it's important that we remain adaptable so we can collaborate effectively with AI and take advantage of the opportunities it offers in the language that model is proficient in. An important aspect of stakeholder management, where the stakeholder is an AI agent...

Continuous Learning and Adaptability

The pace of technological change requires SP to remain agile and receptive to new ideas. Engaging in lifelong learning through online courses, workshops, and professional networks ensures that programmers stay current with

emerging trends and evolving industry standards. Leveraging resources such as webinars, podcasts, and academic literature helps SPs maintain a competitive edge and adapt to shifting demands in the analytics field. Industry recognized certifications can slightly validate technical expertise and signal commitment to professional development. Earning certifications can open doors to new opportunities, increase marketability, and provide structured pathways for learning more. Be selective in picking certification options that are aligned with their career goals and also align with your organization's strategy.

Embracing Emerging Technologies: ML Frameworks, Cloud-Based Tools, and AI Applications

The integration of ML frameworks with cloud-based platforms is transforming analytics workflows by providing scalable options for data storage, computation, and collaboration. SP should actively explore these technologies to keep informed and identify opportunities to automate processes, enhance reproducibility, and accelerate model deployment. Keeping up with new developments and trying out innovative tools helps programmers use the latest solutions for changing business requirements, as well as gain insight into how each solution is created and functions. Which will make us an informed stakeholder, rather than a customer for these solutions where a provider or function creates a tool and we are left with figuring out how to incorporate it.

"Learning AI ways is better than expecting it to learn our ways, because if AI learned human, it would probably just ghost us after an update"

Stakeholder Management and Interdisciplinary Communication Skills

As analytics become more reliant on teamwork involving people with varied backgrounds, effective collaboration is crucial. SP need to strengthen their communication abilities to connect both technical and non-technical stakeholders. Turning complex analyses into practical insights and staying updated with evolving regulations are essential. By mastering data storytelling and regularly reviewing data insights, you can guide decision-making and encourage a culture that values innovation driven by data where SP play a key role. Consistent engagement in cross-functional meetings and feedback sessions promotes improved clarity and fosters mutual understanding throughout the course of a study or project. Understanding the needs of other functions and how you can incorporate them into your analysis and process could go a long way, how you can educate them on what they might need and where to focus on, can quickly help bridge the relationship.

Leadership and Influence

SP have unique opportunities to lead by championing best practices, traceability and identifying data dependencies. By proactively adopting new methodologies and fostering a culture of continuous improvement, SP can shape organizational strategies and influence the direction of analytics initiatives. Leadership also involves advocating for ethical data use, promoting diversity in teams, and transparency. Cultivating strong leadership within analytics teams encouraging open dialogue about challenges and successes and facilitating knowledge sharing across disciplines can help focus on the strategy that can solve the problems and speed up the data flow from drug discovery to regulatory submissions and significantly help patients. AI cannot yet address every challenge; SPs can help identify bottlenecks and offer solutions that enable leadership to determine the best way forward.

"AI tools are not merely a solution for today, but a lens of possibilities that will shape the landscape of tomorrow."

Change in Scope

It is possible that the traditional role of SP may evolve into a broader designation such as "Data Business Analyst" or "Data Scientist". In this envisioned future, SP would not only focus on technical skills but would also develop a deep understanding of data within the context of business needs. Rather than focusing solely on specs authoring, programming and validation, these evolved roles would be responsible for understanding the data, identifying key business questions, and clearly articulating detailed requirements for further analysis. Once these business or analytical requirements are established, the next step would involve communicating them to specialized AI and ML

engineers. These engineers would then construct, customize, or select suitable models to address the specified analysis tasks. Alternatively, if appropriate AI models already exist, these morphed roles could translate the requirements into precise prompts or metadata that guide AI applications to produce the necessary insights. This shift would place greater emphasis on the ability to bridge technical and business perspectives, ensuring that the power of AI and ML is effectively harnessed to meet organizational goals while enabling professionals to play a pivotal role in shaping how analytics are performed in the era of intelligent automation.

The alternative theory is a little more aggressive where SAP, Protocol and other documents are digitized and data is labelled and AI ready to be automatically fed into an AI model to generate analysis required for study reports and regulatory submissions. Unfortunately, there is no clear role for SPs in this theory, but fortunately this is still a theory.

What if AI is hype?

While the likelihood of AI being merely hype or a bubble seems extremely remote (based on what I have seen, I would argue it's virtually nonexistent), let's entertain this scenario for the sake of reflection. Suppose none of the anticipated AI use cases or companies live up to expectations, resulting in a dramatic downturn in global markets and leaving trillions of dollars' worth of infrastructure and computer systems obsolete. Even in such a situation, embarking on this journey toward AI adoption would not have been in vain. The process itself would have opened doors to technological innovation, offering numerous opportunities to refine and elevate our existing processes and infrastructure.

Along the way, we would have established new partnerships and cultivated trust across different departments and functions, demonstrating our value as indispensable collaborators and data experts. Beyond these immediate gains, the pursuit of AI-driven transformation would have fostered a culture of adaptability and resilience, preparing teams to swiftly respond to future technological shifts whether driven by AI or other emerging trends. The collaborative efforts inherent in such initiatives would enhance communication, encourage cross-functional knowledge sharing, and create a foundation for continuous improvement. Ultimately, even if the AI revolution falls short on most of its promises, the skills, relationships, and infrastructure developed throughout the journey will empower us to remain competitive, innovative, and ready to embrace whatever the future holds.

"AI is that coworker who keeps bragging it'll take over the world but still needs me to tap its shoulder when it is hallucinating."

We cannot afford not to change

Despite the multitude of potential outcomes on the horizon, it is crucial to reflect on the real implications of AI for our profession. How far can AI truly progress, and will our roles remain unchanged, or will they evolve into something entirely new? If, by some chance, AI turns out to be more hype than substance, the impact on our field may be less dramatic, yet we cannot afford to ignore the necessity of adaptation. On the other hand, if AI fulfills its anticipated promise, we still have the opportunity to emerge more resilient and capable than ever before. However, the greatest risk lies in the scenario where these technological advances materialize, and we find ourselves unprepared to respond. Such a development could fundamentally disrupt not only the profession of SP but could also reshape the broader landscape of data-driven careers, potentially rendering some roles obsolete in the most extreme cases.

This is not a distant, hypothetical threat or a sensationalized doomsday prediction. The transformation is already underway, as evidenced by the rapidly evolving nature of data analytics and automation. Failing to recognize and respond proactively to these changes may lead to unexpected and unwelcome surprises, not a decade from now, but much sooner. Therefore, it is imperative that we embrace change, invest in continuous learning, and position ourselves at the forefront of innovation to ensure our relevance and success in the era of intelligent automation.

Uncertainties

Change remains the one constant amid a landscape filled with possibilities and uncertainty. In the practical reality of an unpredictable world, a multitude of factors can significantly shape the way we work and influence the broader

geopolitical environment. For example, shifts in global stability, regulatory policies, and international relations can directly impact operational strategies and priorities across industries.

Healthcare access is another area affected by these uncertainties. There are instances where individuals may not seek in-hospital care, whether due to public health concerns, logistical barriers, or changes in patient behavior. Such trends can alter the patterns of healthcare delivery and require organizations to adapt their approaches to patient engagement and data collection.

Financial considerations also play a crucial role. Programs such as Medicaid and Medicare in the United States have experienced reductions in reimbursement rates, which can strain healthcare providers and limit the resources available for patient care. When governments reduce payments or do not provide sufficient reimbursement, healthcare organizations must find innovative ways to maintain quality services and ensure sustainability.

Furthermore, the evolving use of Real-World Data (RWD) is transforming how insights are generated and decisions are made within the industry. By leveraging data derived from actual patient experiences outside of traditional clinical trials, organizations can gain a more comprehensive understanding of treatment outcomes, healthcare utilization, and population health trends. However, the integration of RWD also presents new challenges relating to data quality, privacy, and interpretation, which must be carefully managed to realize its full potential.

Collectively, these factors underscore the importance of remaining adaptable and responsive to change. By proactively monitoring and addressing shifts in the geopolitical landscape, healthcare access, financial policies, and technological advancements, organizations and professionals can better navigate uncertainty and position themselves for sustained success in an ever-evolving environment.

Conclusion

SP play a pivotal role at the heart of the ongoing transformation toward data-driven decision making in the era of AI and ML. As the analytics landscape evolves at an unprecedented pace, the expertise and adaptability of SP are more crucial than ever. By not only mastering essential programming languages but also embracing emerging technologies, fostering interdisciplinary collaboration, and committing to lifelong learning, SP can significantly broaden their impact within organizations. These efforts do not merely drive innovation; they serve as the foundation for maintaining relevance and achieving sustained career progression in a climate of rapid technological change.

The current moment demands decisive action. The risks of inaction are substantial, those who fail to proactively upskill and adapt may find themselves unprepared for the shifting demands of the profession, or worse, may face obsolescence as automation and AI become more deeply integrated into core business processes. Conversely, those who seize the initiative will be best positioned to lead, influence data strategy, and guide organizations through uncertainty with confidence and authority. Not everyone who doesn't adapt will lose their job, nor will all SP roles disappear. As work evolves, certain positions will be phased out or altered. These shifts will inevitably create new career opportunities and roles, but to pursue them, ongoing learning and adaptability remain essential.

Our intent is to provide everyone with practical, actionable strategies to empower themselves: to take charge of their professional development, anticipate and adapt to technological disruptions, and emerge as leaders in a dynamic analytics ecosystem. The path forward, however, is not one-size-fits-all. Each individual must determine the approach that aligns with their unique goals, strengths, and circumstances. It is up to you to set your own pace, whether that means moving swiftly to master the latest advancements or taking measured steps to deepen your expertise or waiting to see what these transpire to. Maintaining a commitment to Learning and Development and adopting a growth mindset throughout this period of change will ensure you are well equipped to address any challenges that may occur.

RECOMMENDED READING

The Future of Professions by Richard Susskind and Daniel Susskind

Prediction Machines: The Simple Economics of Artificial Intelligence by Ajay Agrawal et al.

Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron

Thinking with Data by Max Shron

How to Become a Data Scientist by Monica Rogati, Harvard Business Review

The Role of Open Source in Data Science by Jake VanderPlas, O'Reilly Radar

Tech Talk for Managers: Bridging the Gap Between Business and Development by Andrew McCracken

<https://medium.com/@contact.mooseek/tech-talk-for-managers-bridging-the-gap-between-business-and-development-06d2a250d709>

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AI Usage disclosure:

I have heavily relied on Microsoft Copilot to correct grammar, condense long sentences, and rephrase statements for clearer communication. It took me a few iterations to refine and come up with acceptable quotes as well.

Evaluation of this paper with zeroGPT clocked in at 62% on Feb4th 2026.

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