NHS
Cornwall and
Isles of Scilly

Business Intelligence programming policy for Python and R

Date approved: 28 September 2023

NHS Cornwall and Isles of Scilly Integrated Care Board

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1. Introduction

This policy outlines guidelines and standards for utilising Python and R programming languages within NHS Cornwall and Isles of Scilly (CIoS) Integrated Care Board (ICB) for business intelligence (BI) purposes. The ICB recognises the value of modern programming languages in enhancing data analysis, visualisation, and decision-making processes. Python and R offer powerful tools and libraries that can significantly advance the capabilities of our BI efforts.

2. Purpose

In today's rapidly evolving healthcare landscape, the ICB aims to leverage Python and R as integral components of our BI strategy. These programming languages provide a multitude of benefits that align with our commitment to data-driven decision-making and efficient healthcare delivery.

2.1. Benefits of Using Python and R

Utilising Python and R in our BI practices offers several key advantages.

- Versatility: Python and R are versatile languages capable of handling a wide range of tasks, from data preprocessing and cleaning to complex statistical analysis and machine learning.
- Rich ecosystem: Both Python and R have extensive libraries and packages tailored for data analysis, visualisation, and modelling. This enables our teams to access a wealth of resources and tools for advanced analytics.
- Data visualisation: Python and R provide robust options for creating meaningful visualisations, aiding in the communication of insights and trends to both technical and non-technical stakeholders.
- Statistical analysis: R, in particular, is renowned for its statistical capabilities, making it an ideal choice for in-depth statistical analysis and hypothesis testing.
- Machine learning: Python's and R's wide adoption in the machine learning community offers opportunities to develop predictive models and algorithms that can enhance patient care, resource allocation, and operational efficiency.
- Integration: Python and R can be seamlessly integrated with existing data systems, databases, and platforms, facilitating smoother data exchange and integration.
- Open source community: Both languages have thriving open-source communities that contribute to continuous development, support, and innovation, ensuring that our tools stay up to date.
- Custom solutions: Python and R allow us to develop customised solutions tailored to our specific business intelligence needs, empowering our teams to address unique challenges effectively.
- Reduce health inequalities: The use of these tools for analytical purposes will positively impact patients who experience health inequalities, by flagging points of health inequalities in the system in order for action to be taken.

By adopting Python and R as part of our BI practices, the ICB is poised to unlock new insights, improve decision-making processes, and enhance patient outcomes through data-driven approaches.

3. Definitions

- Integrated Care Board (ICB): Refers to the organisational entity responsible for coordinating and delivering integrated healthcare services within Cornwall.
- Python: A widely used, open-source programming language known for its simplicity and versatility. Python is commonly used for data analysis, scripting, web development, and more.
- R: A programming language and environment designed for statistical computing and graphics. R is widely used in data analysis, statistical modelling, and visualisation.
- Business Intelligence (BI): Team within the ICB responsible for collecting, analysing, and transforming data into actionable insights to support informed decision-making.
- Code style guidelines: A set of established rules and conventions that govern the formatting, naming, and organisation of code to ensure consistency and readability.
- Data security: Measures and practices implemented to protect sensitive data from unauthorised access, disclosure, alteration, or destruction.
- Patient confidentiality: The ethical and legal obligation to protect patients' personal and medical information from unauthorised disclosure, in accordance with applicable laws and regulations.
- Version control: The practice of tracking and managing changes to code, documents, or any other form of content, enabling collaboration, history tracking, and code integrity.
- Modularity: The design principle of breaking down code into smaller, self-contained units (modules) that perform specific tasks, enhancing code maintainability and reusability.
- Data visualisation: The creation of visual representations, such as charts, graphs, and dashboards, to communicate patterns, trends, and insights from data.
- Statistical analysis: The process of using statistical methods to analyse and interpret data, uncover relationships, and draw conclusions.
- Machine learning: A branch of artificial intelligence focused on developing algorithms that enable systems to learn from data and make predictions or decisions without explicit programming.
- Open source community: A group of developers, users, and contributors who collaboratively create, maintain, and improve open-source software and resources.
- Documentation: Annotations, comments, and explanations added to code to provide clarity about its functionality, purpose, and usage.

4. Responsibilities

4.1. Business Intelligence team leads

- Enforce compliance with this policy within their respective teams.

- Oversee the adherence to programming standards, data security, and patient confidentiality.
- Facilitate regular code reviews to ensure code quality, documentation, and adherence to best practices.
- Promote knowledge sharing, collaboration, and continuous learning among team members.
- Ensure that team members receive adequate training and support for Python and R programming.
- Ensure that any sensitive patient information is handled and processed in accordance with legislation and privacy regulations.

4.2. Data analysts and developers

- Develop Python and R code in accordance with established programming standards and guidelines.
- Ensure that data handling practices align with legislation, data security and patient confidentiality policies.
- Document code thoroughly to explain functionality, assumptions, and any data transformations.
- Participate in peer code reviews and address feedback promptly.
- Collaborate with team members to share knowledge, insights, and best practices.
- Ensure that any sensitive patient information is handled and processed in accordance with legislation and privacy regulations.

4.3. Data security and compliance officers

- Provide guidance on data security measures and ensure compliance with data protection regulations and policies.
- Review Python and R code to identify potential security vulnerabilities or data privacy risks.
- Collaborate with business intelligence teams to implement necessary security measures and controls.
- Ensure that any sensitive patient information is handled and processed in accordance with legislation and privacy regulations.

4.4. IT and infrastructure teams

- Provide technical support for the setup, configuration, and maintenance of Python and R environments.
- Ensure that the required hardware and software resources are available for Python and R development.
- Collaborate with BI teams to monitor system resources and optimise performance.
- Implement appropriate access controls and permissions for code repositories and data sources.

4.5. Training and development specialists

- Develop and deliver training programs on Python and R programming, covering best practices and security measures.

- Provide ongoing support and resources for team members to enhance their programming skills.
- Facilitate workshops and knowledge-sharing sessions to promote continuous learning and improvement.

4.6. Senior management and governance board

- Provide support for the implementation of this policy across the ICB.
- Review and approve any exceptions or deviations from the policy based on justifiable business needs.

5. Programming standards

5.1. Code style and formatting: All Python and R code must follow established coding style guidelines. Clear and consistent naming conventions should be used for variables, functions, and objects.

5.2. Documentation: Code should be thoroughly documented using comments and docstrings. Explain the purpose, functionality, and any assumptions made within the code.

5.3. Modularity and reusability: Code should be designed in a modular and reusable manner to enhance efficiency and maintainability.

5.4. Version control: Implement effective version control systems to track changes, collaborate, and effectively manage code versions.

6. Data security and confidentiality

6.1. Data handling: All data processing and manipulation must align with legislation and ICB data handling policies. Handle sensitive patient information with the utmost care and not to be stored within code repositories.

6.2. Access control: Ensure that only authorised personnel have access to data, code repositories, and business intelligence tools.

6.3. Encryption: Encrypt data transmission and storage to safeguard against unauthorised access.

7. Collaboration and knowledge sharing

7.1. Code review: Randomised Python and R will undergo peer review to identify and address potential issues and ensure compliance with programming standards.

7.2. Knowledge sharing: Foster collaboration and knowledge sharing through documentation, regular team meetings, and training sessions.

8. Performance and optimisation

8.1. Efficient code: Strive to write efficient and optimised code to enhance the performance of business intelligence processes.

8.2. Resource management: Monitor and manage system resources (memory, processing power) to prevent performance bottlenecks.

9. Compliance and governance

9.1. Regulatory compliance: Ensure that all Python and R code adheres to relevant ICB policies, regulations, and guidelines.

9.2. Audit trails: Maintain clear audit trails of code changes, approvals, and deployments.

10. Licensing and intellectual property

The ICB is committed to ensuring that the use of open-source code aligns with licensing and intellectual property best practices. This section outlines how the ICB will handle licensing and intellectual property concerns associated with the utilisation of open-source code.

10.1 Licensing requirements: All open-source code employed by the ICB must adhere to approved licenses that are compatible with the intended use of the ICB. These licenses should align with the goals and objectives of the ICB's business intelligence initiatives. Prior to integration, the ICB shall evaluate and confirm that the chosen open-source licenses permit the desired use of the code within the context of our projects.

10.2 License assessment: The ICB will undertake a thorough assessment of the licenses associated with open-source code to ensure compatibility and compliance. The assessment process will consider the rights granted by the licenses, any restrictions imposed, and the obligations required, including sharing modifications and attributing original authors. This evaluation will guarantee that the ICB's use of open-source code is in harmony with the licensing terms.

10.3. Intellectual property rights: The ICB acknowledges the importance of respecting intellectual property rights when using open-source code. The ICB's stance is aligned with the principles outlined in the NHSX open-source policy, which prioritises responsible and ethical use of intellectual property. The ICB will ensure that the incorporation of open-source code respects the intellectual property rights of contributors and communities.

10.4. Attribution and notices: To uphold compliance with open-source licenses, the ICB will establish clear procedures for appropriate attribution and the maintenance of required notices. Any open-source code integrated into ICB projects will be properly attributed to its original authors and contributors. The ICB will also ensure that all

required notices, disclaimers, and license information are accurately included in the relevant project documentation.

11. Sourcing code from known repositories

The ICB recognises the importance of sourcing open-source code from established repositories. This section outlines the ICB's approach to acquiring and utilising code from known repositories to ensure code quality, licensing compliance, and seamless integration into ICB projects.

11.1. Source verification: The ICB is committed to sourcing open-source code from repositories known for their reliability, authenticity, and reputable maintenance. Priority will be given to repositories maintained by NHS England and other trusted entities. The ICB's BI teams will follow a process of source verification to ensure that code is obtained from reputable sources that align with the ICB's data-driven goals.

11.2. Code quality assessment: Before incorporating code from known repositories into ICB projects, the ICB's BI teams will conduct a comprehensive assessment of code quality. This assessment will include a review of coding standards, documentation practices, and adherence to established best practices. The ICB will ensure that sourced code meets the required standards for reliability and effectiveness.

11.3. License review: Code sourced from known repositories will undergo a meticulous license review process to ensure alignment with the ICB's intended use and compliance with the policy's guidelines. The ICB will verify that the open-source licenses associated with the sourced code permit the desired utilisation within the context of ICB projects and align with the ICB's programming policy.

11.4. Integration with ICB projects: The ICB is dedicated to integrating code sourced from known repositories into its business intelligence projects while upholding programming standards and established guidelines. BI teams within the ICB will collaborate to ensure that sourced code seamlessly integrates with existing workflows and contributes to the advancement of data analysis and decision-making processes.

12. Training and support

12.1. Training: Provide training and resources to employees on Python and R programming best practices and security measures.

12.2. Support: Offer technical support and guidance to employees using Python and R for business intelligence.

13. Implementation plans and monitoring effectiveness

13.1. Responsibilities: BI team leads are responsible for enforcing this policy and ensuring compliance within their teams.

13.2. Consequences of Non-Compliance: Non-compliance with this policy may result in disciplinary actions.

14. Update and review

The review date will be 1 year after approval as the technology is continually changing. The review may happen earlier than planned if the context of the document changes. For example, where legislation changes. It is the responsibility of the author (or nominated officer) to be aware of the context of the document and to undertake the review promptly as appropriate.

Equality impact assessment

Name of policy or service to be assessed: Python and R policy
Department or section: Business Intelligence
Date of assessment: 19 September 2023
Person(s) responsible for the assessment: Sarah Jenkin, Head of information, intelligence and insights
Is this a new or existing policy? New

Aims, objectives and purpose of the policy

Describe the aims, objectives, and purpose of the policy.
Python and R are new open source tools to enable data analysis automation and artificial intelligence algorithms.
As they are open source they could come with risks so the policy puts in practice measures to mitigate those risks.

Who is intended to benefit from this policy, and in what way?
The Cornwall NHS community. Without these measures being put in place, the ICB is opening the health community in Cornwall to cyber-attacks.

What outcomes are wanted from this policy?
Minimising risks associated with using open-source free analytical tools.

What factors or forces could contribute or detract from the outcomes?
Non-compliance to the policy

Who are the main stakeholders in relation to the policy?
Business Intelligence team members

Who implements the policy, and who is responsible for the policy?
Business Intelligence

Differential impacts

Does this have a positive or negative impact on people from an ethnic minority background? How will any negative impact be mitigated?
The use of the tool or adherence to the policy doesn't impact people from ethnic minority backgrounds but the use of these tools for analytical purposes will help to bridge the gap for health inequalities which this cohort of the population may be more likely to experience.

Does this have a positive or negative impact on people who identify as male, female or intersex? How will any negative impact be mitigated?
The use of the tool or following the policy does not have any impact.

What is the positive or negative differential impact on people from the perspective of disability? How will any negative impact be mitigated?

The use of the tool or following of the policy will not make a difference based on disability, however, the AI functionality this provides will positively impact patients with a disability and flag points of health inequalities in the system in order for action to be taken.

Does this have a positive or negative impact on people who identify as heterosexual, lesbian, gay, bisexual, pansexual or asexual? How will any negative impact be mitigated?
The use of the tool or following the policy does not have any impact.

What is the positive or negative differential impact on people from the perspective of age? How will any negative impact be mitigated?
The use of the tool or following of the policy will not make a difference based on age however, the AI functionality this provides will flag points of health inequalities based on age, in the system in order for action to be taken.

What is the positive or negative differential impact on people from the perspective of religion or belief? How will any negative impact be mitigated?
The use of the tool or following the policy does not have any impact.

What is the positive or negative differential impact on people from the perspective of marriage and civil partnership? This is particularly relevant for employment policies. How will any negative impact be mitigated?
The use of the tool or following the policy does not have any impact.

Does this have a positive or negative impact on people who identify as trans or transgender, non-binary, or gender fluid? How will any negative impact be mitigated?
The use of the tool or following the policy does not have any impact.

Does this have a positive or negative impact on people who are pregnant, breast feeding mothers, or those on maternity leave? How will any negative impact be mitigated?
The use of the tool or following the policy does not have any impact.

Are they any other identified groups? How will any negative impact be mitigated?
The tools being used are aimed at recognising these health inequalities from within the data so mitigations can be made.

Human rights values

How have the core human rights values of fairness, respect, equality, dignity, and autonomy been considered in the formulation of this policy, service, or strategy?
Everyone has fairness in terms of using and access to the policy

Which of the human rights articles does this document impact?

☐ To life

☐ Not to be tortured or treated in an inhuman or degrading way
☐ To liberty and security
☐ To a fair trial
☒ To respect for home and family life, and correspondence
☐ To freedom of thought, conscience, and religion
☐ To freedom of expression
☐ To freedom of assembly and association
☐ To marry and found a family
☐ Not to be discriminated against in relation to the enjoyment of any of the rights contained in the European Convention
☐ To peaceful enjoyment of possessions

What existing evidence (either presumed or otherwise) do you have for this?
Reference to the human rights statement and guidance document. Responsibilities for data security, patient confidentiality and appropriate information governance are clearly outlined within the policy.

How will you ensure that those responsible for implementing the policy are aware of the human rights implications and equipped to deal with them?
Reference to the human rights statement and guidance document. Mandatory equality, diversity and human rights training. Responsibilities for data security, patient confidentiality and appropriate information governance are clearly outlined within the policy.

Public Sector Value Act 2012

NHS Cornwall and Isles of Scilly is committed and obliged to fulfil the requirements of the Public Sector Social Value Act 2012. This Act requires the organisations to consider how services commissioned or procured might improve the economic, social, and environmental wellbeing of an area.

Please describe how this will support and contribute to the local system, wider system, and community.
The use of artificial intelligence can help to analyse large scale patterns and trends. The ICB holds linked data from various system partners and so this tool can help to aide recognition of underrepresented areas to address these inequalities.

Describe how the policy contributes towards eliminating discrimination, harassment, and victimisation.
The use of artificial intelligence can help to analyse large scale patterns and trends. The ICB holds linked data from various system partners and so this tool can help to aide recognition of underrepresented areas to address these inequalities.

Describe how the policy contributes towards advancing equality of opportunity.
Identifying and tackling health inequalities will contribute to promotion of equality of opportunity.

Describe how the policy contributes towards promoting good relations between people with protected characteristics.
The use of artificial intelligence can help to analyse large scale patterns and trends. The ICB holds linked data from various system partners and so this tool can help to aide recognition of underrepresented areas to address these inequalities.

If the differential impacts identified are positive, explain how this policy is legitimate positive action and will improve outcomes, services and or the working environment for that group of people.
The policy clearly outlines the roles and responsibilities of colleagues in utilising Python and R. By adopting Python and R as part of our BI practices, the ICB is poised to unlock new insights, improve decision-making processes, and enhance patient outcomes through data-driven approaches. Using the tool can help to aide recognition of underrepresented areas to address health inequalities.

Explain what amendments have been made to the policy or mitigating actions have been taken, and when they were made.
None

If the negative impacts identified have been unable to be mitigated through amendment to the policy or other mitigating actions, explain what your next steps are using the following equality impact assessment action plan.
No negative impacts identified

Equality impact assessment action plan

Issue to be addressed	Action required	Responsible person	Timescale for completion	Action taken
N/A	N/A	N/A	N/A	N/A

Comments on action plan:
N/A

Signed (completing officer): Sarah Jenkin

Date: 19 September 2023

Signed (head of department or section): Sarah Foster

Date: 19 September 2023

Please ensure that a signed copy of this form with the policy is sent to both the corporate governance team and equality and diversity lead.