

Paper Summary

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Title: Data Driven Science for Clinically Actionable Knowledge in Diseases

Authors: Daniel R. Catchpoole, Simeon J. Simoff, Paul J. Kennedy, Quang Vinh Nguyen (eds.)

DOI: 10.1201/9781003292357

Year: 2024

Publication Type: Edited Book (Multiple Chapters)

Discipline/Domain: Health Informatics / Biomedical Data Science

Subdomain/Topic: Data-driven analytics for actionable clinical insights in disease diagnosis, treatment, and prevention

Eligibility: Eligible

Overall Relevance Score: 85

Operationalization Score: 80

Contains Definition of Actionability: Yes (implicit and partial explicit in Preface)

Contains Systematic Features/Dimensions: Yes

Contains Explainability: Yes

Contains Interpretability: Yes

Contains Framework/Model: Yes

Operationalization Present: Yes

Primary Methodology: Mixed Methods (case studies, computational methods, literature reviews)

Study Context: Multiple diseases (diabetes, COVID-19, tuberculosis, Parkinson's, cancer), computational

Geographic/Institutional Context: Australia (primary), multi-country contexts for specific studies

Target Users/Stakeholders: Clinicians, health policymakers, biomedical researchers, data scientists

Primary Contribution Type: Conceptual synthesis + applied case studies + methodological frameworks

CL: Yes

CR: Yes

FE: Yes

TI: Yes

EX: Yes

GA: Yes

Reason if Not Eligible: N/A

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Data Driven Science for Clinically Actionable Knowledge in Diseases

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****Discipline/Domain:****

Health Informatics / Biomedical Data Science

****Subdomain/Topic:****

Data-driven analytics for actionable clinical insights in disease diagnosis, treatment, and policy

****Contextual Background:****

The volume addresses the intersection of computational, biological, and medical sciences, focusing on h

****Geographic/Institutional Context:****

Primarily Australian studies (notably NSW), with global relevance and examples.

****Target Users/Stakeholders:****

Clinicians, health policymakers, biomedical researchers, computational and data scientists.

****Primary Methodology:****

Mixed methods — applied computational models, literature reviews, methodological frameworks, and em

****Primary Contribution Type:****

Conceptual and applied synthesis for operationalizing data-driven actionable healthcare insights.

General Summary of the Paper

This edited collection explores state-of-the-art computational and visual analytics methods to produce *cl

Eligibility

Eligible for inclusion: ****Yes****

How Actionability is Understood

Actionability is framed as the capacity of data-driven insights to directly support ****clinical actions**** in real

> “...focuses on ‘close the loop’ analytical processes to enrich and lead actionable knowledge” (Preface,

> “...computational and visual analytics... for discovering actionable knowledge in support of clinical action

What Makes Something Actionable

- Direct linkage to clinical decision points
- Context relevance to patient journeys or population health
- Timeliness of insights (e.g., early diagnosis or intervention)
- Interpretability for clinical stakeholders
- Integration into existing healthcare workflows
- Feasibility with available data and resources
- Trustworthiness of analysis outputs

How Actionability is Achieved / Operationalized

- **Framework/Approach Name(s):** Close-the-loop analytical process; methodological framework for bio
- **Methods/Levers:** Data integration (multi-source clinical, genomic, imaging), computational modeling
- **Operational Steps / Workflow:** Data linkage, feature engineering, model training, interpretable output
- **Data & Measures:** Linked health records (e.g., Lumos dataset), imaging data, genomic/RNA-seq data
- **Implementation Context:** Clinical decision-making, public health policy, personalized medicine, rare c

> “...integral analysis... for discovering actionable knowledge in support of clinical actions in real environ

> “...visual analytics... enabling the effective exploration and interpretation of complex biomedical data” (

Dimensions and Attributes of Actionability (Authors’ Perspective)

- **CL (Clarity):** Yes — clear, interpretable outputs required for adoption.
- > “...meaningful visualisation and human–information interaction” (p. xiv)
- **CR (Contextual Relevance):** Yes — grounded in specific patient cohorts and health system contexts
- > “...linked patient records for generating clinically actionable knowledge” (p. xv)
- **FE (Feasibility):** Yes — focus on methods applicable within real healthcare settings.
 - **TI (Timeliness):** Yes — emphasis on early prescriptions, rapid diagnostics, timely policy inputs.
 - **EX (Explainability):** Yes — multiple chapters on explainable ML and visualization (Ch. 9).
 - **GA (Goal Alignment):** Yes — alignment with improved health outcomes, policy goals.
 - **Other Dimensions Named:** Trust, interpretability, user engagement (Ch. 10).

Theoretical or Conceptual Foundations

- Close-the-loop analytics in health systems
- Explainable AI and interpretable ML frameworks
- Human-information interaction theory
- Decision support and trust in visualization literature

Indicators or Metrics for Actionability

- Reduction in unplanned hospital admissions
- Mortality rate changes within defined periods
- Model accuracy, false positive/negative rates
- Timeliness of intervention post-diagnosis

Barriers and Enablers to Actionability

- **Barriers:** Data silos, inter-site variability, trust issues, lack of interpretability, small sample sizes for research
- **Enablers:** Data linkage initiatives (e.g., Lumos), harmonization techniques, visual explainability tools

Relation to Existing Literature

The editors situate their approach within a growing body of work on data-driven healthcare, emphasizing

Summary

The volume *Data Driven Science for Clinically Actionable Knowledge in Diseases* synthesizes methods

Scores

- **Overall Relevance Score:** 85 — Strong implicit definition and consistent feature articulation across countries
- **Operationalization Score:** 80 — Multiple concrete frameworks, workflows, and applied cases showing

Supporting Quotes from the Paper

- "...for discovering actionable knowledge in support of clinical actions in real environments" (p. 4)
- "...focuses on 'close the loop' analytical processes to enrich and lead actionable knowledge" (p. xiv)
- "...linked patient records for generating clinically actionable knowledge" (p. xv)
- "...meaningful visualisation and human–information interaction" (p. xiv)
- "...guidance on improving interpretability and trust in health models and visualisations" (p. xviii)

Actionability References to Other Papers

- NSW Health Lumos program studies on GP attendance and hospital visits
- Visual analytics frameworks for biomedical and genomic data
- Explainable AI surveys and visualization literature in health contexts
- Machine learning applications for diagnostics and treatment selection