

# THE GRiST WEB-BASED DECISION SUPPORT SYSTEM FOR MENTAL-HEALTH RISK ASSESSMENT AND MANAGEMENT

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## **ABSTRACT**

*Research into a cognitive model of classification and clinical decision making was used to produce a web-based decision support system for assessing risks associated with mental-health problems. New methods of eliciting clinical expertise were devised so that the cognitive model could encapsulate multidisciplinary consensus and disseminate it across different clinical services and contexts. The goal was to provide universal access to validated expert advice on risk judgements that could be clearly understood by people without a specialist mental-health background and be flexibly presented according to end-user requirements. The output is the Galatean Risk and Safety Tool, GRiST, that covers suicide, self-harm, harm to others, self-neglect, and vulnerability. It is being used by NHS secondary mental-health trusts, private hospitals, charities, primary care IAPT services, and for self-assessment in the community. The aim is to facilitate risk communication across the care pathway and give patients more involvement in monitoring and managing risks.*

## **KEYWORDS**

*cognitive modelling, mental health risk, clinical decision support system, knowledge engineering, care pathway.*

## **1. INTRODUCTION**

The Galatean Risk and Safety Tool, GRiST [1], is a web-based clinical decision support system (CDSS) that records service-user data (cues) and provides risk estimates for suicide, self-harm, self-neglect, vulnerability, and harm to others. The objectives of the GRiST research programme are to: (i) integrate clinical expertise and empirical evidence to help assess and manage risks associated with mental health problems; (ii) develop different versions of GRiST that enable users in any health and social care context (including clinicians, support staff, carers and service users) to speak a common risk language, and thus communicate and act on risk information more effectively across multiple boundaries; (iii) promote safety, self-management and empowerment for service users; and (iv) provide a clear audit trail for NHS Trusts to demonstrate the relationship between patients' risk profiles, clinicians' risk judgments, management plans, and outcomes of care.

## **2. THE PROBLEM WITH MENTAL HEALTH RISK ASSESSMENT**

One of the most critical problems with current risk-assessment tools in mental health is the lack of evidence or formal models for processing the interrelationships of cues. This is why actuarial methods are not sufficient and why the UK Department of Health [2] advocates approaches that combine structured clinical judgement with empirical evidence.

### **3. INNOVATION**

GRiST differs from alternative risk-assessment tools by its use of a psychological model of classification at the heart of the CDSS. This “Galatean” model [3] explains how people use cues to determine class or outcome likelihoods. It is based on the premise that clinicians respond to conditional probabilities of outcomes given cues and that these probabilities compete with each other for influence on classification. The model’s validity was demonstrated by explaining people’s response patterns in psychological experiments and provides the evidence for using it within CDSSs [3]. GRiST is the only approach that explicitly captures structured clinical judgement and links it to sophisticated probabilistic and statistical analyses of the patient database, as recommended by [2].

### **4. KNOWLEDGE ENGINEERING WITH GRiST**

The psychological underpinnings of GRiST led to knowledge engineering techniques for eliciting clinical expertise in formats that propagate its intuitive nature through the elicitation and implementation cycles. This ensured the knowledge and reasoning processes were easy to validate by mental-health clinicians at the same time as being amenable to machine processing. It resulted in a unique formal model of risk knowledge [4] that formed the basis of an ontology for exploitation by semantic-web technologies. Parameterisation of the model remained a problem, though, because each node within the hierarchy requires a weighting of its influence compared to its siblings. Human experts cannot provide these weights because there are several thousand nodes so linear regression methods have been devised for learning them from the accumulating clinical GRiST database, which currently has about 20,000 assessments. The problem is non-trivial in practice because not all the knowledge hierarchy is applicable to every patient or every assessment circumstance. Hence there are many parts of the tree that provide values of zero or have no input data, both of which cause problems with regression fitting.

### **5. RESULTS AND ONGOING ACTIVITIES**

There are now three validated versions of GRiST in routine clinical practice (Working-Age Adults (18-65 years), Older Adults, and Younger People), which provide detailed service-user risk profiles across the lifespan that support but do not replace clinicians’ risk judgments. Versions for specialised populations (e.g. learning disabilities) and primary care are under development, along with a service-user version, myGRiST, that enables people to monitor and manage their own risks whilst living at home. This means GRiST will span the entire patient care pathway from the community, through primary and secondary mental health care, and back to the community. It will also be available for use in other front-line agencies such as the criminal justice system, housing associations, accident and emergency departments, and charities. As more organisations and clinicians use GRiST, the database of anonymous risk profiles will increase in size and enable pattern recognition tools to provide unique evidence about how combinations of risk factors contribute to risks. The upshot will be better understanding of how risks arise, how they are evaluated, and how they can be managed.

### **REFERENCES**

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