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***Abstracts*:**

A Computational Framework for Identity and its Web-Based Realization

William Nick, Madison Mccotter, Siobahn Day, Marguerite McDaniel, Hannah Foster, Emma Sloan, James Mayes and Albert Esterline

This paper presents a computational framework for identity as it is particularly focused on identifying the culprit in a crime scene investigation. A case is conceptualized as a constellation of situations in the sense of Barwise's situation theory. Data on a case is stored as RDF triples in a triple store. Several relevant OWL ontologies have been developed and supplemented with SWRL rules. Uncertainty and combining levels of (possibly conflicting) evidence are handled with Dempster-Shafer theory. A webpage is being developed to make available to students of criminal justice the results of our work. The user will be able to query about evidence and follow how it accrues to various hypotheses.

A Distributed Framework for Monocular Visual SLAM

Ruwan Egodagamage and Mihran Tuceryan

In Distributed Simultaneous Localization and Mapping (SLAM), multiple agents generate a global map of the environment while performing its local SLAM operation.

One of the main challenges is to identify overlapping maps, specially when agents do not know their relative starting positions. In this paper we are introducing a distributed framework which uses an appearance based method to identify map overlaps. Furthermore, our framework generates a global semi-dense map using monocular visual SLAM agents.

A Rough Sets Artificial Intelligent Agent for Autonomous Prediction and Dynamic Feedback for High Performance Athletes

Rory Lewis and Michael Bihn

In the continuous effort to an autonomous artificial intelligent agent to dynamically communicate to a high performance athlete how much time remains for that athlete to sustain his current effort in watts, and then, when in correct to autonomously recalibrate its algorithms to not make that same mistake again, it takes a series of experiments to ascertain what algorithms are most suited for this goal. This paper illustrates how experiments using Rough Set Theory for the machine's intelligence was leveraged to predict performance limits in elite athletes. The field of measuring elite athletes's abilities is based upon measurements such as maximal O2 consumption (V O2max), Heart beats per minute (bpm), Watts of energy (watts and kilojoules) and peak power output ((Ppeak)) to name a few. Because there is an element of uncertainty and imprecision in measuring human performance, this field of art suits the likes of Rough Set Theory. The aim of this paper is to demonstrate that Rough Set Theory is remarkably adept at yielding accurate

predictions of performance limits at a particular time. The aforementioned leads one to the hypothesis that a Rough Set engine may, in the future, select the best Knowledge Discovery in Database (KDD) tool form a plurality of KDD, fuzzy, neural and machine learning tools - to eventually become intelligent in predicting the performance limits of high performance athletes. This paper first reviews lactate and blood issues in delivering O2 to muscles, then it presents the rough set hypothesis, experimentations and experiment results.

A Study of How People Infer Social Relationships from People's Behavior in Simple Economic Games

Nathan Blank, Charles Kemp and Alan Jern

We explore several models of social reasoning to better understand how people make inferences about people's social relationships after observing their behavior. In an experiment, we find that there are individual differences in subjects' social inferences and no single model accounts well for most subjects' inferences.

An Eyes and Hands Model for Cognitive Architecture to Interact with User Interfaces

Farnaz Tehranchi and Frank Ritter

We propose a cognitive model to interact with interfaces. The main objective of cognitive science is understanding the nature of the human mind to develop a model that predicts and explains human behavior. These models are useful to Human-Computer Interaction (HCI) by predicting task performance and times, assisting users, finding error patterns, and by acting as surrogate users. In the future these models will be able to watch users, correct the discrepancy between model and user, better predicting human performance for interactive design, and also useful for AI interface agents. To be fully integrated into HCI design these models need to interact with interfaces. The two main requirements for a cognitive model to interact with the interface are (a) the ability to access the information on the screen, and (b) the ability to pass commands. To hook models to interfaces in the general way we work within a cognitive architecture. Cognitive architectures are computational frameworks to execute cognition theories—they are essentially programming languages designed for modeling. Prominent examples of these architectures are Soar [1] and ACT-R [2]. ACT-R models could access the world interacting directly with the Emacs text editor [3]. We present an initial model of eyes and hands within the ACT-R cognitive architecture that can interact with Emacs.

Automated IQ Estimation from Writing Samples

Austin Hendrix and Roman Yampolskiy

The primary focus of this research is to introduce a method of measuring an individual's IQ by analyzing the vocabulary in said individual's writing. In this paper, we show that the ratio of SAT words in a dataset of writing

samples is roughly normally distributed, though with an obvious left skew. We go on to show a method that can be used to calculate an individual's IQ with this ratio and provide samples with measured accuracy. The conclusion suggests ways to increase accuracy in order to further develop the research along with applications of doing so.

Automating the Encoding for the LISA Model of Analogy from Raw Text

Sean Wilner and Je Hummel

Analogy is an integral part of human cognition. Consequently researchers would like to produce computational models of analogy to test implementations of theoretical claims. Such computational models have relied almost exclusively upon hand-coded representations, making the resulting models too dependent upon the modeler's choices, and thus difficult to interpret in isolation of the modeler. In an effort to combat this dependency, we present here a means of automatic encoding for the LISA model of analogy and inference.

Building Customized Text Mining Tools via Shiny Framework: The Future of Data Visualization

Olga Scrivner, Vinita Chakilam, Jivitesh Poojary, Nilima Sahoo, Stephan De Spiegeleire and Chandan Uppuluri

With the increasing number of data volumes, there is a growing need for dynamic data visualization to help reveal instant changes in data patterns. While there exist many commercial visualization tools, traditional scholars are often disengaged from the tool development process, thus the choice of functionalities remains up to tool developers and their choice may not always fit the end-users. This collaboration, however, has a potential in bridging the gap between traditional scholars who are more interested in sense-making of the text than in the tools and the data scientists who are more interested in the tools than in the substance, but who still require ways to validate the outcomes. Until recently, such a collaborative process was hindered by the complexity of customization procedures and technological hurdles imposed on users with new installations. With the advent of reactive web frameworks, such as Shiny, the user-driven customization becomes not only feasible but also essential to advance scientific research. In this paper, we demonstrate a collaborative effort between learned scholars and tool developers, allowing for "synthesis of computational and humanistic modes of inquiry".

Can AI Reason over Representational Systems?

Matthew Wyss, Aaron Thieme and John Licato

This poster investigates the possibility of an AI reasoning over representational systems. In artificial intelligence research, this marks a shift from an AI merely reasoning from within one. Given an AI and a set of representational systems, our question is whether an AI reasoner can choose between the representational systems for the purpose of some application. We

begin by defining representational systems and recommending formality as a useful metric for choosing between them. Next, we provide a precise, general interpretation of formality as object invariance. We argue that more work will have to be completed on problems associated with AI and pragmatics (e.g., context sensitivity) before an account can be developed of how AI can fruitfully reason over representational systems.

Compound Sentence Segmentation and Sentence Boundary Detection in Urdu

Asad Iqbal, Asad Habib and Jawad Ashraf

The raw Urdu corpus comprises of irregular and large sentences which need to be properly segmented in order to make them useful in mathematical linguistics. This makes the Compound Sentences Segmentation (CSS) timely and vital research topic. The existing online text processing tools are developed mostly for computationally developed languages such as English, Japanese and Spanish etc., where sentence segmentation is mostly done on the basis of delimiters.

Our proposed approach uses sentence delimiters (special characters) and computationally extracted sentence-end-letters and sentence-end-words as identifiers for segmentation of large and compound sentences. The raw and un-annotated input text is passed through preprocessing and word segmentation. Urdu word segmentation itself is a complex task including knotty problems such as space insertion and space deletion etc. Main and subordinate clauses are identified and marked for subsequent processing. The resultant text is further processed in order to identify, extract and then segment large as well as compound sentences into regular Urdu sentences.

Urdu computational research is in its infancy. Our work is pioneering in Urdu CSS and results achieved by our proposed approach are promising. For experimentation, we used a general genre raw Urdu corpus containing 2616 sentences and 291503 words. We achieved 34% improvement in reduction of average sentence length from 111 w/s to 38 w/s (words per sentence). This increased the number of sentences by almost three times to 7536 shorter and computationally easy to manage sentences. Resultant text reliability and coherence are verified by Urdu language experts.

Context-Based Heuristics in Attribution

Jim Chen

In cyber forensics, attribution of an attack, which finds out details about the individual(s) who launched an attack, is more important than mere identification of an attack, since a precise response to the cyber attack heavily depends upon attribution. The identification of the initiator(s) in attribution provides precise targeting for a counter-attack. However, heuristics are typically deployed to find out information about attack actions rather than initiator(s) of attack actions. This paper proposes a mechanism that utilizes a

weight sys-tem for guiding the way in which the heuristics prioritize the discovery of attacker initiator(s). Linking purpose, methods, time, location, and events with the identified device, the proposed heuristic approach can serve as a path towards ac-curate and prompt attribution.

Continuous Authentication on Smartphones Using Artificial Immune System

Nawaf Aljohani, Joseph Shelton and Kaushik Roy

Most of the authentication systems require the users to provide their credential for authentication purposes by providing their passwords or their biometric data. However, as long as the user remains active in the system, there is no mechanisms to verify whether the user who provides the credential is still in control of the device or not. Most mobile devices rely upon passwords and physical biometrics to authenticate users only when they start using the device. Active authentication based on analyzing the user's touch interaction could be a reasonable solution to verify that a legitimate user is still in control of a smartphone or tablet. In this research, an Artificial Immune Systems (AIS) is proposed to apply to continuously authenticate the users based on touch patterns. Our results show that AIS is able to actively authenticate 96.89% of the users correctly.

Decision Making Swarms

Sanza Kazadi, George Jeno, Xinyu Guan, Nick Nusgart and Andriy Sheptunov

While swarms that execute decisions are well known in the swarm community, swarms that exhibit this capability a priori have never before been achieved. We demonstrate a methodology, based on the Hamiltonian method of swarm design that enables the design and implementation of swarms that exhibit decision-making capability. We develop the theoretical structure of the method and apply it to the development of an ant algorithm and a swarm capable of deciding whether its dessity exceeds a specific predetermined value. The swarm designs are validated in simulation.

Deep Barca: A Probabilistic Agent to Play the Game Battle Line

Sean McCulloch, Daniel Bladow, Tom Dobrow and Haleigh Wright

Recent years have seen an explosion of interest in "modern" types of board games. These differ from the types of games typically seen in Artificial Intelligence research (e.g. Chess, Checkers, Go) in that they often have a large component of randomness, or nonpublic information, making traditional game-tree methods infeasible. Often, these games have an underlying mathematical structure that can be exploited. In this paper, we describe an intelligent agent to play the game Battle Line, which uses elements of theorem-proving and probability to intelligently play without utilizing game trees. The agent is superior to the only other known computer player of the game, and plays at a level competitive with top human players

Feature Selection for Malware Classification

Mitchell Mays

In applying machine learning to malware identification, different types of features have proven to be successful. These features have also been tested with different kinds of classification methodologies and have had varying degrees of success. Every time a new machine learning methodology is introduced for classifying malware, there is the potential for increasing the overall quality of malware classification in the field. Even new classifiers with the same accuracy as those used previously can be combined using one of a few different ensemble techniques sharpen the classification and raise the accuracy to new heights.

For my purposes I have attempted to create a coalition of classifiers which each use different features. These classifiers when trained, provide multiple angles to the same problem and can be used to test ensemble techniques. Eventually such an ensemble of individual malware classifiers could create a highly precise means of picking out malware from other software.

Specifically, I have created a convolutional neural network which processes byte data as an image, and a deep feed forward neural network which utilizes opcode N-gram features. Both of these classifiers, while not perfect, provide a significant level of classification. They achieve this independently of one another, and when combined, they each contribute enough to improve the final accuracy. The majority of the effort in this research was placed on gathering the N-gram features, a time and resource intensive process. Tinkering with the parameters or structure of classifiers could provide further improvements to the system.

How Similar are the Twins? : Using Psycholinguistic Tests to Determine Similarity Among Near-Synonyms

Pranay Yadav and Anupam Basu

A word usually expresses a number of implications, connotations and attitudes in addition to its lexicon meaning. And a word often has near-synonyms that differ from it solely in these nuances of meaning and in the degree of expression. In a truly articulate machine translation or natural language generation system, there is a need of a highly sophisticated lexical-choice process that can determine which of the near-synonyms is best suited for a given word. The most widely used lexical database for English, WordNet, organizes the near-synonyms into synonym sets (also called synsets) but fails to assign a finer semantic similarity between these near-synonyms for yielding a better lexical-choice process. In this paper, we discuss a set of psycholinguistic experiments in a classical setting, aimed to address this particular task in hand.

Image Understanding - A Brief Review of Scene Classification and Recognition

Vineeta Singh, Deeptha Girish and Anca Ralescu

With over 40 years of history, image understanding, in particular, scene classification and recognition remains central to machine vision. With an abundance of image and video databases, it is necessary to be able to sort and retrieve the images and videos in a way that is both efficient and effective. This is possible only if the categories of images and/or their context is known to a user. Hence, the ability to classify and recognize scenes accurately is of utmost importance.

This paper presents a brief survey of the advances in scene recognition and classification algorithms.

Is there a place for Machine Learning in Law?

Stephan Ralescu and Anca Ralescu

Research in artificial intelligence and law goes back approximately 40 years. It remains largely based on formal logic, including non-monotonic logic, case-based reasoning, and logic programming. However, some researchers in and practitioners of law have argued in favor of quantitative approaches (e.g. probability) to account for uncertainties in legal arguments. Other researchers have pointed some of the shortcomings of the current artificial intelligence and law research, e.g. inability to take context into account. At the same time, machine learning has made huge inroads in many different fields and applications, and therefore, the question is whether machine learning has anything to offer to the theory, and, equally important, the practice of law. As a position paper, this is a preliminary study towards the exploration of a synergistic integration of current artificial intelligence approaches in law, with machine learning approaches. It puts forward the idea that formal, logic-based approaches, currently very popular the Artificial Intelligence & Law research, could benefit from an extension with a machine learning component, and discusses some ways in which machine learning could be integrated into these approaches.

Learning Others' Intentional Models in Multi-Agent Settings Using Interactive POMDPs

Yanlin Han and Piotr Gmytrasiewicz

Interactive partially observable Markov decision processes (I-POMDPs) provide a principled framework for planning and acting in a partially observable, stochastic and multi-agent environment, extending POMDPs to multi-agent settings by including models of other agents in the state space and forming a hierarchical belief structure. In order to predict other agents' actions using I-POMDP, we propose an approach that effectively uses Bayesian inference and sequential Monte Carlo (SMC) sampling to learn others' intentional models which ascribe them beliefs, preferences and rationality in

action selection. For problems of various complexities, empirical results show that our algorithm accurately learns models of other agents and has superior performance in comparison with other methods. Our approach serves as a generalized reinforcement learning algorithm that learns over other agents' transition, observation and reward functions. It also effectively mitigates the belief space complexity due to the nested belief hierarchy.

Learning Photography Aesthetics with Deep CNNs

Gautam Malu, Bapi Raju Surampudi and Bipin Indurkhya

Automatic photo aesthetic assessment is a challenging artificial intelligence task. Existing computational approaches have focused on modeling a single aesthetic score or class (good or bad photo), however these do not provide any details on why the photograph is good or bad; or which attributes contribute to the quality of the photograph. To obtain both accuracy and human-interpretability, we advocate learning the aesthetic attributes along with the prediction of the overall score. For this purpose, we propose a novel multi-task deep convolution neural network (DCNN), which jointly learns eight aesthetic attributes along with the overall aesthetic score. We report near-human performance in the prediction of the overall aesthetic score. To understand the internal representation of these attributes in the learned model, we also develop the visualization technique using back propagation of gradients. These visualizations highlight the important image regions for the corresponding attributes, thus providing insights about model's understanding of these attributes. We showcase the diversity and complexity associated with different attributes through a qualitative analysis of the activation maps.

Morphognosis: The Shape of Knowledge in Space and Time

Thomas Portegys

Artificial intelligence research to a great degree focuses on the brain and behaviors that the brain generates. But the brain, an extremely complex structure resulting from millions of years of evolution, can be viewed as a solution to problems posed by an environment existing in space and time. The environment generates signals that produce sensory events within an organism. Building an internal spatial and temporal model of the environment allows an organism to navigate and manipulate the environment. Higher intelligence might be the ability to process information coming from a larger extent of space-time. In keeping with nature's penchant for extending rather than replacing, the purpose of the mammalian neocortex might then be to record events from distant reaches of space and time and render them, as though yet near and present, to the older, deeper brain whose instinctual roles have changed little over eons. Here this notion is embodied in a model called morphognosis (morpho = shape and gnosis = knowledge). Its basic structure is a pyramid of event recordings called a morphognostic. At the apex of the pyramid are the most recent and nearby events. Receding from the apex are less recent and possibly more distant events. A morphognostic can thus be

viewed as a structure of progressively larger chunks of space-time knowledge. A set of morphognostics forms long-term memories that are learned by exposure to the environment. A cellular automaton is used as the platform to investigate the morphognosis model, using a simulated organism that learns to forage in its world for food, build a nest, and play the game of Pong.

Natural Logic in AI and Cognitive Science

Larry Moss and Michael Wollowski

This paper presents an ongoing research project called ``natural logic'' and makes the case that it is relevant to AI, Computational Linguistics, and Cognitive Science. We propose to add some of the natural logic modules which have already been developed to existing NLP systems. We see our approach as complementing and augmenting data-driven approaches exemplified by IBM's Watson. We give a brief introduction to natural logic and present examples of proofs that can be given in a working system. We furthermore introduce monotonic logic, another promising approach for extracting information from sentences that contain quantifiers. We finish the paper by presenting some early workthat integrates syllogistic reasoning into exsiting NLP systems.

Not Interfering: Simultaneous Typed Chat in COMPS Computer-Mediated Dialogues

Michael Glass, Anthony Nelson, Chinedu Emeka and Jung Hee Kim

COMPS computer-mediated typed-chat collaborative learning exercises permit the students to type at the same time. People can see and respond to each other's text in real time. Although everybody talking at the same time does not work in spoken conversation, students quickly discover they can type at the same time without interfering with each other. About 40% of typing occurs in this condition. Studies of educational dialogue will have to take into account the interactions that the new computer-mediated communication regime affords. In this paper we characterize the varieties of interaction that are observed during simultaneous typing. Students do not engage in a tightly-interleaved two-way exchange while they are typing together, generally each student is responding to something that another student said earlier.

Proof-of-Concept: Creating "Fuzzy" Sorting Algorithms

Stephany Coffman-Wolph

Sorting algorithms are common tools for manipulating data and used in both standalone circumstances and within larger more complex algorithms. Thus, it is highly desirable for sorting algorithms to be efficient in terms of storage and computation. By applying the concept of fuzzy logic (an abstract version of Boolean logic) to any well-known algorithm, it generates an abstract version (i.e., fuzzy algorithm) that often results in computational improvements. Although the algorithm may produce a less precise result, this is counteracted by gaining computational efficiency with minimal acceptable

trade-offs (e.g., small increase in space requirements, loss of precision). Using an established three-step framework for fuzzification of an algorithm, the resulting new fuzzy algorithm goes beyond a simple conversion of data from raw to fuzzy data by converting the operators and concepts within the algorithm to their abstract equivalents. The purpose of this paper is to demonstrate, as a proof-of-concept, that sorting algorithms can be converted into their corresponding fuzzy sorting algorithms. This paper discusses: (1) how to apply the general framework by developing the corresponding fuzzy algorithms for a variety of sort algorithms, (2) the success of applying the framework through the development of several fuzzy sort algorithms including fuzzy shell sort, fuzzy strand sort, and fuzzy bucket sort, and (3) the possible applications and benefits of these fuzzy sort algorithms.

Replicate the Mind Rather than the Brain: An Alternative Approach to Model Human Thinking

Niklas Hageback and Niklas Hageback

This paper proposes an integration of the psycho-logical-physiological underpinnings for modelling human thinking through approximating the mind as it provides for less design issues given its relatively simplistic abstract concept vis-à-vis the complexities of the brain. Its core method is to combine the opposing ideas from Freud and Jung to the Dual Process Theory, this offering an approach which brings the associative and the rule based systems together into a holistic model with a protocol that governs the switches between conscious and unconscious logic depending on input and scenario. With the establishment of such mechanistic rules and dynamic constants, tested through a big data approach from public media, they allow for standardization and machine generated thinking and thus the introduction of a new computer architecture. The paper provides a work-in-progress status of an ongoing project to develop a prototype of a virtual mind and the underlying theory and the development steps are in detailed outlined in the book The Virtual Mind - Designing the logic to approximate human thinking (Taylor & Francis) due for publication in 2017.

Robotic Misdirection, For Good Causes: Strategically Deceptive Reasoning in Artificial Generally Intelligent Agents

Max Fowler, Arron Thieme and John Licato

Deception is a core component of human interaction and reasoning, and despite its negative connotation, it can be used in positive ways. We present our formalization behind strategic deception, one such potentially positive form of deception. We use the Cognitive Event Calculus (CEC) to model strategic deception, building on prior formalizations. First, we provide a brief overview of deception's definitions within existing literature. Following this discussion, CEC is described and we present CEC-style inference rules for strategic deception. These rules and a positive motivating deception example are used to show how we can solve the problem of strategic deception. This

proof is demonstrated both through application of our rules and by adapting our rules for MATR (Machina Arachne Tree-based Reasoner) to show how proving can be performed by automatic reasoners. Finally, we discuss what future steps can be taken with strategic deception.

Semi-Supervised Random Forest for Intrusion Detection Network

Ningxin Shi, Xiaohong Yuan and William Nick

In order to protect valuable computer systems, network data needs to be analyzed and classified so that possible network intrusions can be detected. Machine learning techniques have been used to classify network data. For supervised machine learning methods, they can achieve high accuracy at classifying network data as normal or malicious, but they require the availability of fully labeled data. Semi-supervised machine learning methods, however, can use a small number of labeled examples and train a large number of examples without label.

In this research, we explore the use of semi-supervised Random Forest in classifying network data and intrusion detection. It was used to classify the Third International Knowledge Discovery and Data Mining Tools Competition dataset (KDD 1999) and the result were compared with the results of using the supervised methods of Support Vector Machine, Random Forest, and Deep Belief Network. The results were also compared with those using ladder network, an approach which combines unsupervised neural networks, in classifying KDD 1999.

Shortest Total Path Length Spanning Tree via Wisdom of Artificial Crowds Algorithm

Madeline Hundley and Roman Yampolskiy

This paper presents a hybrid genetic algorithm (GA) with Wisdom of Artificial Crowds (WoAC) approach to solving an NP-hard problem. This is a novel approach to solving Shortest total-Path-length Spanning Tree (SPST) problems. In our tests this approach achieved results up to 12% better than use of the genetic algorithm alone.

Syntactic Differentiation in Oscar Wilde's "Dorian Gray"

Melissa Wright and Reva Freedman

We analyzed Oscar Wilde's novel "The Picture of Dorian Gray". We parsed every sentence using the Stanford Parser. Analysis of the parse trees showed that we could distinguish narrative from quoted text using any of the following: sentence length, height of the parse tree, sentence length, and a variety of conjunctions.

The Robot Mafia: A Test Environment for Deceptive Robots

Brad Lewis, Isaac Smith, Max Fowler and John Licato

Future robotic agents may be required to reason about a given situation and decide whether it is appropriate to lie to or deceive humans. One type of

deception, known formally as strategic deception, is the act of influencing others toward a specific goal through non-truths.

To demonstrate and test for the kind of reasoning required in strategic deception, we use a modified form of the social strategy game ``Mafia'' as a testing ground.

In the game, the townsfolk, who can be seen as an uninformed majority, must determine who amongst themselves are members of the informed minority (the Mafia) via social cues before the Mafia eliminate all the townsfolk.

First, we talk about how strategic deception applies to Mafia. Then, we present the rules of the game in a predefined, partially formalized, logic-based language. Once formalized, the rules can then be provided to an automated theorem prover, which can carry out the necessary reasoning. By using this automated theorem prover we discuss how one can demonstrate automated strategic deception.

Timetable Design from Even Headways to Even Loads with Dynamic Fuzzy Constraints

Yanan Zhang, Deeptha Girish, Vineeta Singh, Zhaopeng Meng and Anca Ralescu

Timetable scheduling is to adjust departure time of vehicles (while providing comfortable environment for passengers).

Public transit systems have limited resources, such as drivers and number of vehicles and timetables are usually set with with fixed number of bus services and even headways (equal time intervals between successive services).

This study considers the problem of designing a dynamic, fuzzy constraints heuristic algorithm based on average loads of vehicles and fixed number of bus services.

The passenger satisfaction is described as a fuzzy goal, that associates with the number of on-board passengers and vehicle capacity.

A new method of timetable scheduling is proposed in which the decision on the time interval between two successive bus services is obtained by maximizing the decision value of both fuzzy goal and fuzzy constraint.

Experimental results show that the timetable produced by fuzzy decision making can adjusts to the fluctuating passenger flow, and leads to a higher and more even usage of vehicle capacity.

Toward An IoT-based Expert System for Heart Disease Diagnosis

Thai Do Thanh, Quang Tran Minh and Phu H. Phung

IoT technology has been recently adopted in the healthcare system to collect Electrocardiogram (ECG) signals for heart disease diagnosis and prediction. However, noises in collected ECG signals make the diagnosis and prediction system unreliable and imprecise. In this work, we have proposed a new

lightweight approach to removing noises in collected ECG signals to perform precise diagnosis and prediction. First, we a revised Sequential Recursive (SR) algorithm is used to transform the signals into digital format. Then, the digital data is proceeded using a revised Discrete Wavelet Transform (DWT) algorithm to detect peaks in the data to remove noises. Finally, we extract some key features from the data to perform diagnosis and prediction based on a feature dataset. Redundant features are removed by using Fisher's Linear Discriminant (FLD). We have used an ECG dataset from MIT-BIH (PhisioNet) to build a knowledge-base diagnosis features. We have implemented a proof-of-concept system that collects and processes real ECG signals to perform heart disease diagnosis and prediction based on the built knowledge-base.

Transfer Learning of Temporal Information for Driver Action Classification

Joseph Lemley, Shabab Bazrafkan and Peter Corcoran

Correct classification of image data can depend on features learned in multiple sequential frames. We focus on the problem of learning action from video data with an emphasis on driver behavior monitoring. Insufficient quality labeled data is a major problem in machine learning research. This is especially true when deep neural networks are used. Although some sufficiently large, general purpose image databases exist for action recognition, most of these are limited to single frames. This kind of data requires that the action recognition task is applied regardless of the temporal information (information from previous and next frames of a video sequence). In this paper, we show that temporal information is useful for accurate classification of video and that the temporal information in lower layers of a convolutional neural network can successfully be transferred from one network to another to greatly improve performance on the driver behavior monitoring task.

Understanding the U-Shaped Curve: Central Claims and Applications for AI

Bre Anne Briskey, Miriam Greidanus Romaneli, Dustin Hale and John Licato

Investigations regarding how children process information have focused on specific factors, including biological and socio-cultural constraints, environmental cues, and innate predispositions to attend to certain stimuli. All of these factors have demonstrated important influences on how children learn and communicate new ideas and abilities. However, much of the evidence for these effects has come from observations and interpretations of behaviors. While behaviors may be readily observed and interpreted, processes taking place within the child's mind that may be influencing behavior may be quite difficult to identify in many cases. One theoretical perspective that attempts to explain these internal processes, named "representational redescription theory," seeks to explain how children can acquire representations of their

external and internal environments that attain increasing levels of complexity and flexibility. Insight into this process may also have important applications for machine learning and AI, by facilitating the development of progressively more complex skills and capacities in intelligent agents. Yet, such applications can only exist if the concept of 'representation' and its change throughout development is coherent. Unfortunately, work that refers to representational redescription theory has not been consistent on the point of what it means for a representation to change. We will clarify what a representation is and how it changes as predicted by representational redescription theory. This will be followed by an account of Karmiloff-Smith's original operationalizations of key concepts of the developmental curve, based on her landmark 1992 publication. We will then discuss subsequent literature on these predictions, while also clarifying the lack of consensus on how to test representational change independently from behavioral mastery. Finally, we will present alternative methods for measuring this change, in specific neuroconstructivist computational modeling, as well as possible applications of representational redescription to artificial intelligence.

Weather Forcasting Using Artificial Neural Network

Md. Tanvir Hasan, K. M. Fattahul Islam, Md. Sajedul Karim, Lt. Md. Arifuzzaman, Md. Sifat Rahman and Nure Alam Md. Risalat

Weather forecasting is a blessing of modern technology. It enables us to understand the nature of the atmosphere. Precise weather forecasting is one of the greatest challenges in the modern world. Unlike traditional methods, modern weather forecasting involves a combination of computer models, observation (by use of balloons and satellites) and patterns recognition along with various trends. Forecasting can be made accurately and precisely by the proper application of these methods. For forecasting various kinds of computer methods are used and these methods are related to various complex formulas. Researchers have done many things to establish a relationship of recent (input) data and target data which is linear. But practically the relationship is nonlinear. After establishing the nonlinearity, many models have been made to get future weather data. As the weather data is nonlinear, Artificial Neural Network (ANN) has become an effective way of predicting weather data precisely and accurately. Neural Network is a system that can be trained with certain input and output. It creates its own structure based upon how it is trained. In this paper we predicted weather data for a particular month of a season and compared the result for different functions and training method of ANN.

Working Memory Concept Encoding Using Holographic Reduced Representations

Grayson Dubois and Joshua Phillips

Artificial neural networks (ANNs) utilize the biological principles of neural computation to solve many engineering problems, and ANNs also serve as

formal, testable hypotheses of brain function and learning in the cognitive sciences. However, since ANN models often employ distributed encoding (DE) of conceptual information, ANNs are underutilized in applications where symbolic encoding (SE) is preferred (robotics, games, theorem proving, etc.). The Working Memory Toolkit (WMtk) was developed to aid the integration of an ANN-based cognitive neuroscience model of working memory into symbolic systems by mitigating the details of ANN design and providing a simple DE interface. However, DE/SE conversion is still managed by the user and tuned specifically to each learning task. Here we utilize Holographic Reduced Representation (HRR) to overcome this limitation since HRRs provide a framework for manipulating concepts using a hybrid DE/SE formalism that is compatible with ANNs. We validate the performance of the new Holographic Working Memory Toolkit (HWMtk) using two simple partially observable reinforcement learning problems, and show how the HWMtk automates the process of DE/SE conversion for the user while seamlessly providing additional cognitive capabilities such as context switching, cross-task generalization and concept chunking.