AISB Serendipity Symposium (London, 15th June, 2017)
Short Talk Abstracts

Diarmuid O'Donoghue: "The Persistence of Serendipity in the face of Computational Co-Creativity"

Evidence and theory arising from cognitive science strongly suggested that creativity can arise from novel analogical comparisons (Gentner & Forbus, 2011). A computational model of analogy (O'Donoghue et al, 2014; Abgaz et al, 2017) used persistent computational exploration to identify creative comparisons between scientific publications – presenting users with the best analogies to drive their creativity. But is it possible to scale-up models such as "Dr Inventor" to efficiently exploit arbitrarily large corpora millions of publications? Our desire was to swiftly and efficiently identifying creative analogies through computational means, but this abstract highlights specific and unavoidable trade-off between intense computational effort and reliance on serendipity.

Analogical Mapping: First we identified comparisons based on the degree of analogical similarity – involving approximate solution to the central NP-Hard task of graph matching. Somewhat surprisingly, expert evaluation of the resulting creativity did not show the expected relationship between analogical similarity and creativity ratings.

Inference Count: We next looked at the number of inferences arising from each comparison and this showed greater relevance to creativity. But this ultimately proved insufficient for accurate identification of creative comparisons, leaving serendipity play too great a role in our computational co-creativity tool.

Observed Novelty: We then assessed the novelty of these inferences with respect to the knowledge-base of information gleaned from a corpus of scientific publications. This helped detect mischance and thereby promote creative outcomes.

Predicted Novelty: Finally, we compared each inference to all other inferences arising from every other possible analogy - from within the corpus. This is a kind of second order novelty detection in respect of other potential inferences. Again this improved creative outcomes, but still the problem of effortful approximation of serendipitous outcomes remains.

So, a cascade of serendipity seems to be required in finding analogous documents, ones that prompt many inferences, where those inferences are novel relative to known facts and are also novel relative to all other predicted inferences. There appears to be no shortcuts to subverting the role of serendipity creative processes.

Mark Nelson: "Planning failures, planning successes, unexpected outcomes"

Since at least the 1970s, the term 'serendipity' appears regularly in the AI planning literature, usually in passing, in relation to all manner of occurrences: planning failures, planning successes, unexpected outcomes, even expected outcomes. Although these papers rarely have a developed theory of serendipity, being able to benefit from serendipity in one way or another is frequently proposed as a benefit of a particular planning architecture.

This talk will dig into the various ways these systems position themsevelves (often implicitly) in relation to the concept of serendipity, focusing especially two systems from NASA, one of which architects for serendipitous plan failure, and the other one for serendipitous plan success. Finally, an unorthodox planning system with an explicit model of serendipity, Erik Mueller's computational model of daydreaming, is compared with these more 'serious' systems.

Claudia Chirita: "Modelling Serendipity in a Service-Oriented Context"

We explore the algebraic and logical foundations of service-oriented computing in the context of serendipity. Our focus is on the role and natural occurrence of serendipitous events in service-oriented systems, highlighting the pervading features of serendipity.

In service-oriented computing, software applications evolve dynamically to meet their goals through discrete reconfigurations triggered by the need for an external resource and realized through a three-fold process of discovery, selection and binding of service modules. To model creative systems, we regard concepts as modules and concept discovery as service discovery. In this context, we evaluate the usefulness of a concept through the mechanism of service selection, and recast concept blending in terms of service binding.

We show how, by formalizing concepts as algebraic specifications with constraints, we can control the amount of curiosity or experimentation: the looseness of specifications sets the strictness of concept discovery. One salient feature of this approach is the unpredictability of the interactions between service

entities. The continuous change in the availability of modules places us in a dynamic context where chance plays an important role in the evolution of systems. The selection of a most promising concept (provider of a resource) is based on the semantic compatibility of specifications. Because applications change over time, the evaluation of concepts can change as well, generating a focus shift. Moreover, through the evolution of a system, the invention of a new use for a concept is possible: concepts could be repurposed as they become more relevant for different goals or requirements.

Colin Johnson: "Search, Shoddyness, and Serendipity"

Web search is one way for both people and artificial agents to access a vast, constantly updated, albeit biased, source of knowledge about the world. Ongoing development of web technologies means that these searches have become more accurate. This increased accuracy has the consequence that the capacity of these systems to provoke serendipity by returning partial, inaccurate matches has declined. Search has become too good to act as a mechanism for serendipity.

In this talk I would like to consider ways in which we might re-engineer search to provide the kind of shoddy knowledge representation required for serendipity. If we were to build a "serendipity engine" rather than an "search engine", how would such a machine world? How would it represent its information, knowledge, and concepts? How would it make connections? How would it go beyond the idea of similiarity?

One starting point for this is the the theory of concepts. There are a number of theories of how minds group aspects of world into (perhaps fuzzy) concepts. If we want to distort these representations to create broken concepts as provocations for serendipity, how can this be done in the context of each of these theories?

Another is an attempt to enumerate a wide range of ways of making links between pieces of information - in particular, information in different media. One mechanism for serendipity is analogy making across pieces of information from different areas of a large concept-space. How can we enumerate---and computationally implement---different link-making mechanisms, and use these the the building of serendipity engines?

Elaine Ohanrahan: "The role of chance in the machine-generated art of Computer Art pioneer, Desmond Paul Henry"

Desmond Paul Henry (1921-2004) is an acknowledged pioneer of early Computer Art (www.desmondhenry.com). His second 1960's drawing machine was selected by Jasia Reichardt for inclusion in the ICA's Cybernetic Serendipity show of 1968. This machine was a semi-automatic, electro-mechanical, partially chance-based drawing machine constructed from an adapted analogue bombsight computer. Henry's machine was not the only exhibit at this show that involved 'chance'.

For Henry, "the aleatoric " played a significant role in not only this machine's modus operandi but also in his interpretation of key events in his life, which influenced his creative processes. For this Philosopher, Aquinas's suggestion that there are an infinite number of ways of 'going wrong', merely drove him to exploit the unpredictable and turn 'mistakes' into opportunities. Harmonious co-incidences, or serendipity, conjoin to make 'things turn out for the best', as often expressed by Henry in Leibniz's "Pre-established harmony of the universe".

Prior influences include the development of experimental, chance-based processes as found in Modern Art, from Marcel Duchamp to Jackson Pollock. Henry's methods of production incorporated Jean-Paul Tinguley's 'mechanics of chance;' he also called his machine-generated artwork 'Machine Pollocks' and 'Mechanical Fractals.' The aleatoric features inherent to the construction of Henry's drawing machines differ from the random element which may be deliberately incorporated into digital graphic manipulation programmes.

Subsequent drawing machine developments include a comparison between Henry's imprecise, analogue-based drawing machines and those precise ones created by engineer Dr. Jack Tait, including the Homage to Henry Machine (The HHM).

Eilidh McKay: "A sweeping exploration of the role of serendipity as a tool in artistic and creative practice"

A sweeping exploration of the role of serendipity as a tool in artistic and creative practice; relating to the development of the notion of the "Serendiptologist" as artist and inventor, seeking to develop a platform on which to invite serendipity. This understanding then forms the springboard for an exploration of social

serendipity and its role in the cafe (or "third place") setting and to what extent it can be harnessed in order to unearth new ideas, discoveries and connections.

Abigail McBirnie: "Engineered serendipity in modern bibliometric tools"

I used to research serendipity. Indeed, it was the focus of my PhD. Now, though, I'm exclusively a practitioner. Not in serendipity (!) but in research intelligence and analytics. Put simply, my job is to study data related to research outputs, and from these data, to derive practical information useful for strategic decision making.

So what, you say—what's this got to do with serendipity? As it turns out, a fair bit! Bibliometric techniques, especially those featuring network methods, underpin my work on a daily basis. And as some of you may know, bibliometrics and networks have always had a fundamental association with serendipity.

In his role as the founding father of what we know today as Web of Science, Eugene Garfield (who has said much of interest about both serendipity and R K Merton) launched his initial citation indices in the hope that they would enable "systematic serendipity" (Smith, 1964): scientists could find and connect with each other, not through trial and error 'best-guess' keyword searches but instead through citation links between publications.

Today, we have ready access to bibliometric tools that Garfield could only dream of when he conceptualised his original idea of citation as an enabler of networked serendipity. In this short, practice-based talk, I'd like to take you through a few examples of how high performance computing, big data, and analytics come together in modern bibliometric work to produce engineered serendipity.

Stephann Makri: "Serendipity and Information Encountering"

The inherently positive phenomenon of serendipity is of particular interest at the intersection of Information Science and Technology (where it is known as 'Information Encountering' or IE). Encountering useful information unexpectedly can propel people in exciting new information directions, surprising and delighting them along the way. It can also serve as a 'stitch in time' - often yielding substantial reward for seemingly little effort.

Better understanding IE on the Web - how and why it happens, what influences it and how it is currently and might in future be supported by digital information tools - can inform the design of novel tools that support users in having productive information encounters.

We present some of our empirical research aimed at better understanding IE on the Web to inform design. This includes an approach for directly observing Web information encounters (which is tricky, as they cannot be predicted or controlled and there is risk of subtly biasing participants). We also discuss the oxymoron of designing for, even designing to 'create opportunities for' or 'facilitate' serendipity and the role that users play in creating value from the information they encounter.

Lorenzo Lane: "Flâneurs, finitism and the field of mathematics: Exploring the role of chance encounters in the crafting of mathematical perception"

Individuals build up mathematical intuition and mathematical perception through encountering and interrogating phenomena in the mathematical landscape. These encounters often are not planned in advance, but rather emerge through chance, through wandering in the field. During these wanderings mathematicians map out the mathematical landscape, creating local maps and pathways between mathematical structures. These local maps are comprised of personally relevant reference objects which serve to generate the perceptual lenses by which the global field is apprehended. Mathematicians' understanding of the global field is thus constituted on the basis of their assemblies of local reference objects, which serve as perceptual anchor points. In the following presentation I will present observations and interviews with mathematicians collected over 6 months of ethnographic fieldwork at 4 European mathematics institutes. I will provide insight into how local, on the spot engagements with mathematical phenomena generate unique vantage points from which to view and constitute the mathematical field.