

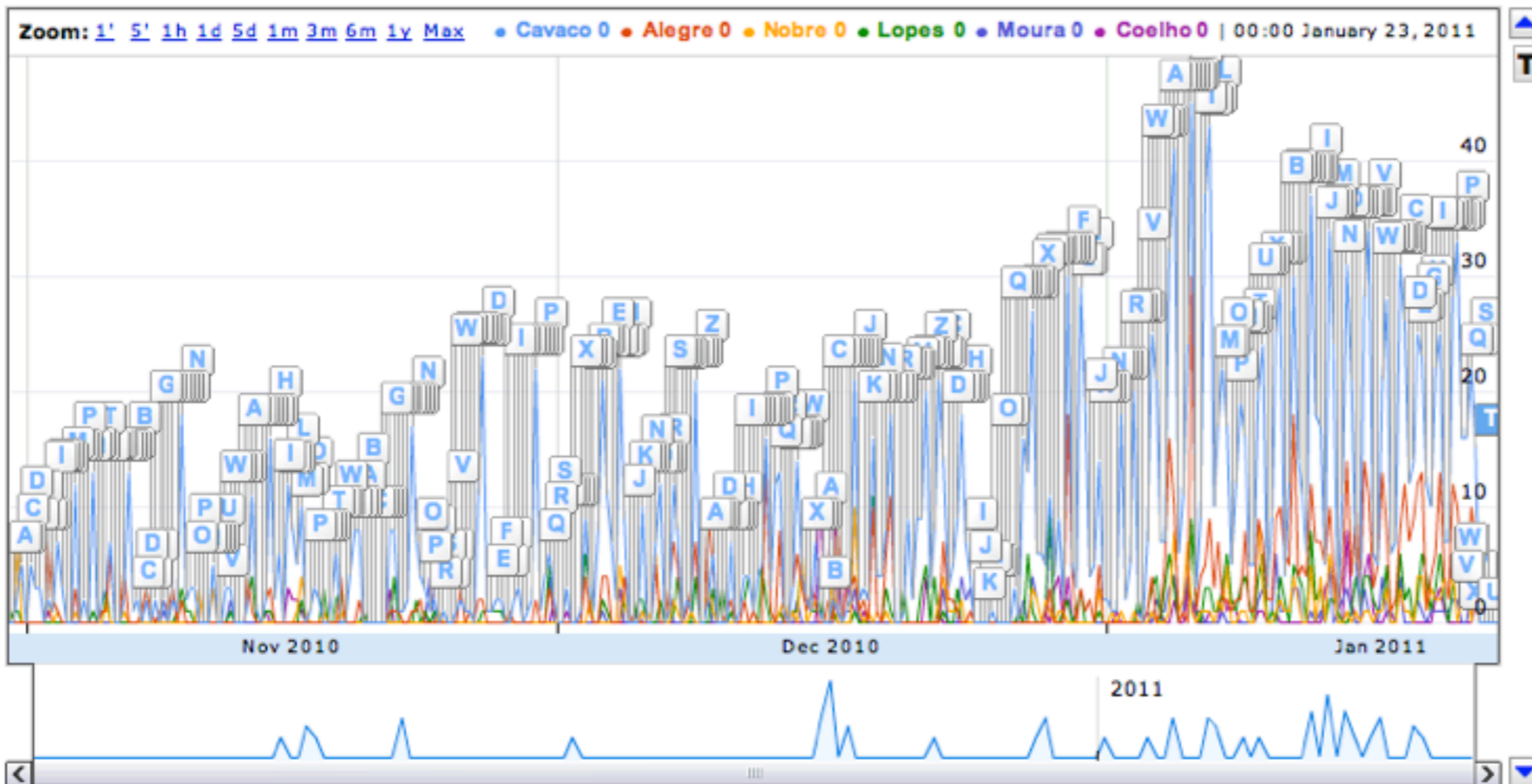
Beyond data visualization in
communication networks:
perceiving collective intelligence

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The Observatorium

Centre for Research and Studies in Sociology

Lisbon University Institute



T. Notícias Francisco Lopes: último dia de campanha, de Almada a Guimarães: ,Cavaco defende a criação de um imposto extraordinário para evitar cortes salariais ,Alegre acusa Cavaco de "caça ao voto" ao propor medidas alternativas aos cortes orçamentais (www.lusa.pt),Imposto extraordinário. Cavaco está na "caça ao voto" ,Cavaco: Casos do BPN e do Algarve foram encomendados aos jornalistas: As notícias sobre a compra e venda de ac... ,Defensor Moura, o candidato que não queria ser Presidente ,Alegre acusa Cavaco de "caça ao voto" a dois dias das eleições ,Cavaco diz que ganha



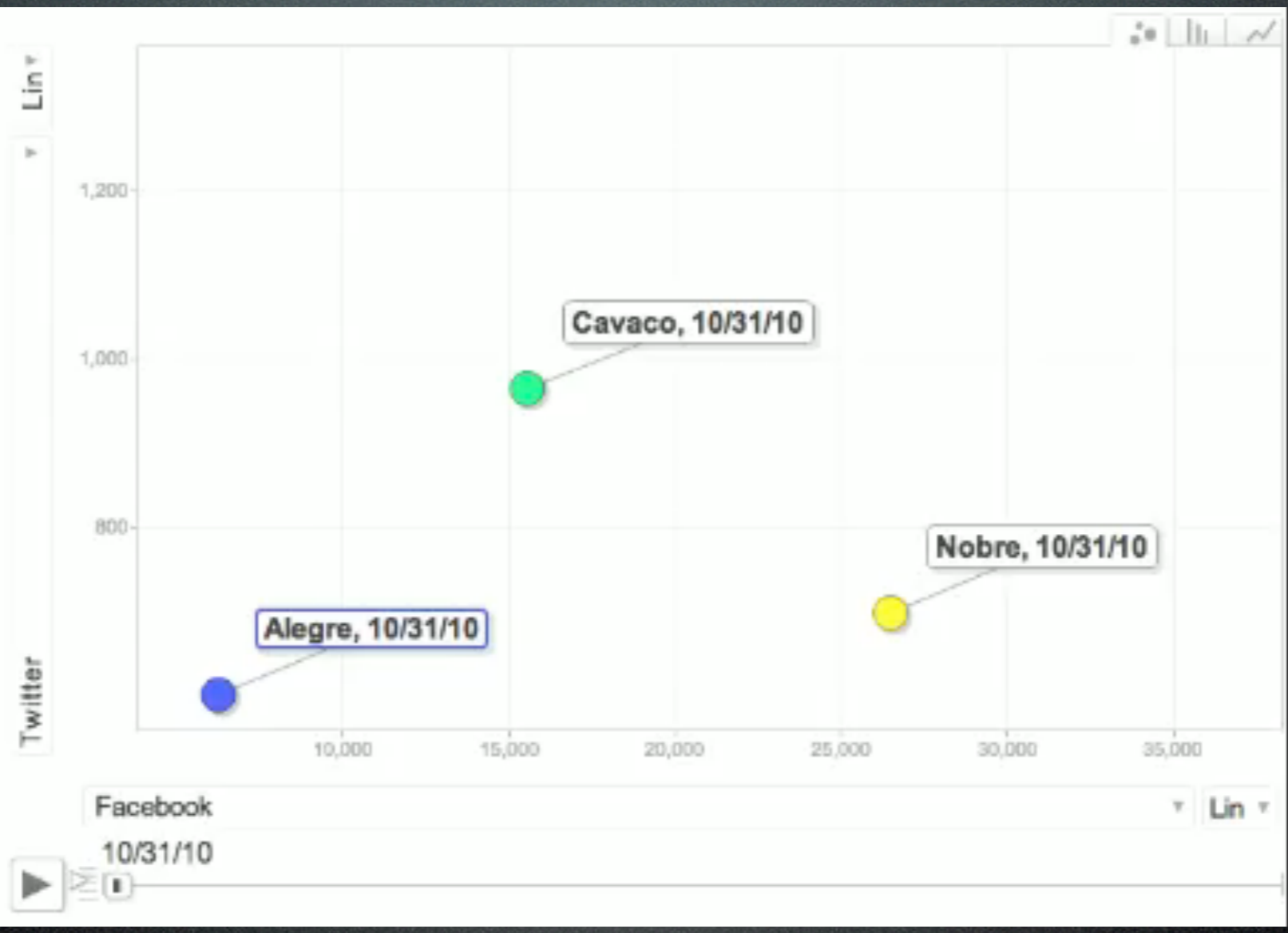
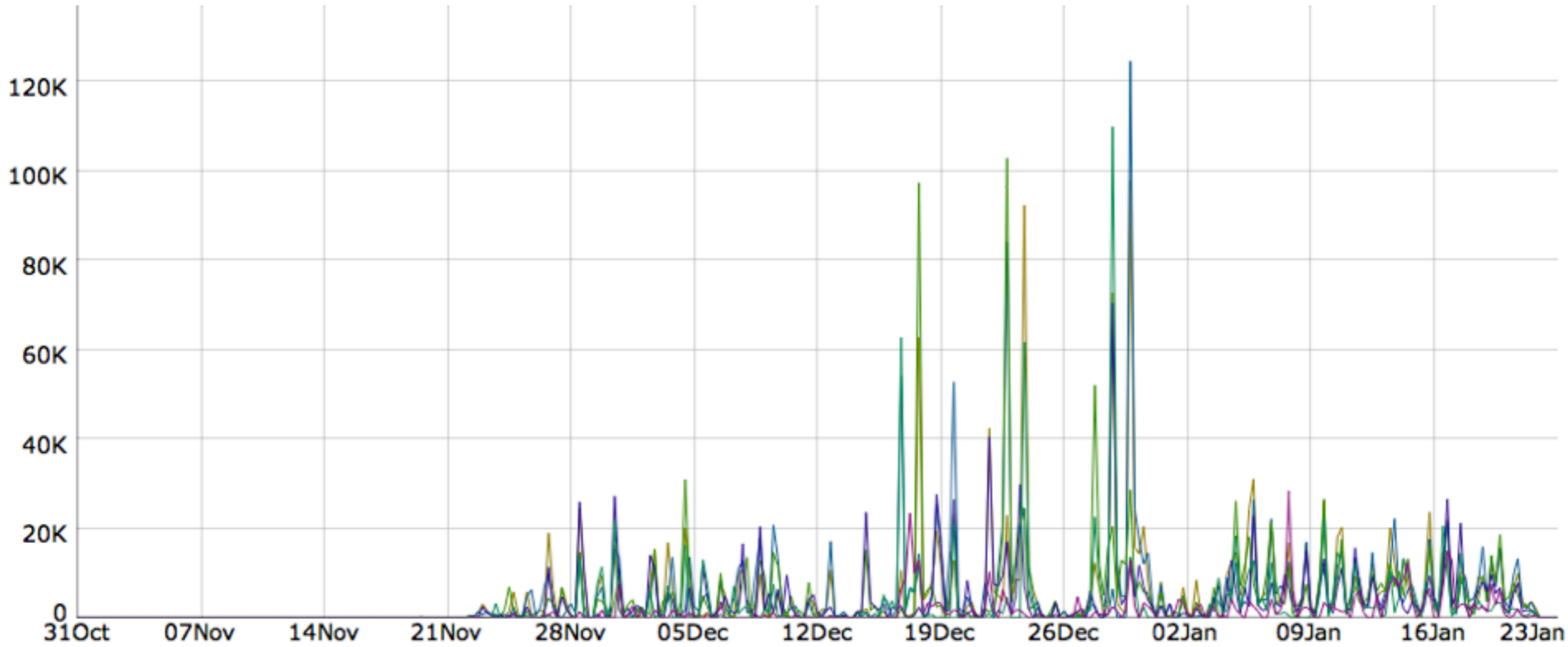


Figure 1. Daily number of tweets per candidate posted on Twitter.









A Formal Definition of the Phenomenon of Collective Intelligence and Its IQ Measure¹

Tadeusz SZUBA

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Abstract. This paper formalizes the concept of Collective Intelligence (*C-I*). Application of the Random PROLOG Processor (*RPP*) has allowed us to model the phenomenon of *C-I* in social structures, and to define a *C-I* measure (*IQS*). This approach works for various beings: bacterial + insect colonies to human social structures. It gives formal justification to well-known patterns of behavior in social structures. Some other social phenomenon can be explained as optimization toward higher *IQS*. The definition of *C-I* is based on the assumption that it is a specific property of a social structure, initialized when individuals organize, acquiring the ability to solve more complex problems than individuals can. This property amplifies if the social structure improves its synergy. The definition covers both cases when *C-I* results in physical synergy or in logical cooperative problem-solving.

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Collective Intelligence:

the marginal extra intelligence added by each new individual participating in the collective

individuals can. This property amplifies if the social structure improves its synergy. The definition covers both cases when *C-I* results in physical synergy or in logical cooperative problem-solving.

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unconscious, random, parallel, and distributed computational process, run in mathematical logic by the social structure

individuals can. This property amplifies if the social structure improves its synergy. The definition covers both cases when *C-I* results in physical synergy or in logical cooperative problem-solving.

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beings and information are modeled as abstract information molecules

individuals can. This property amplifies if the social structure improves its synergy. The definition covers both cases when *C-I* results in physical synergy or in logical cooperative problem-solving.

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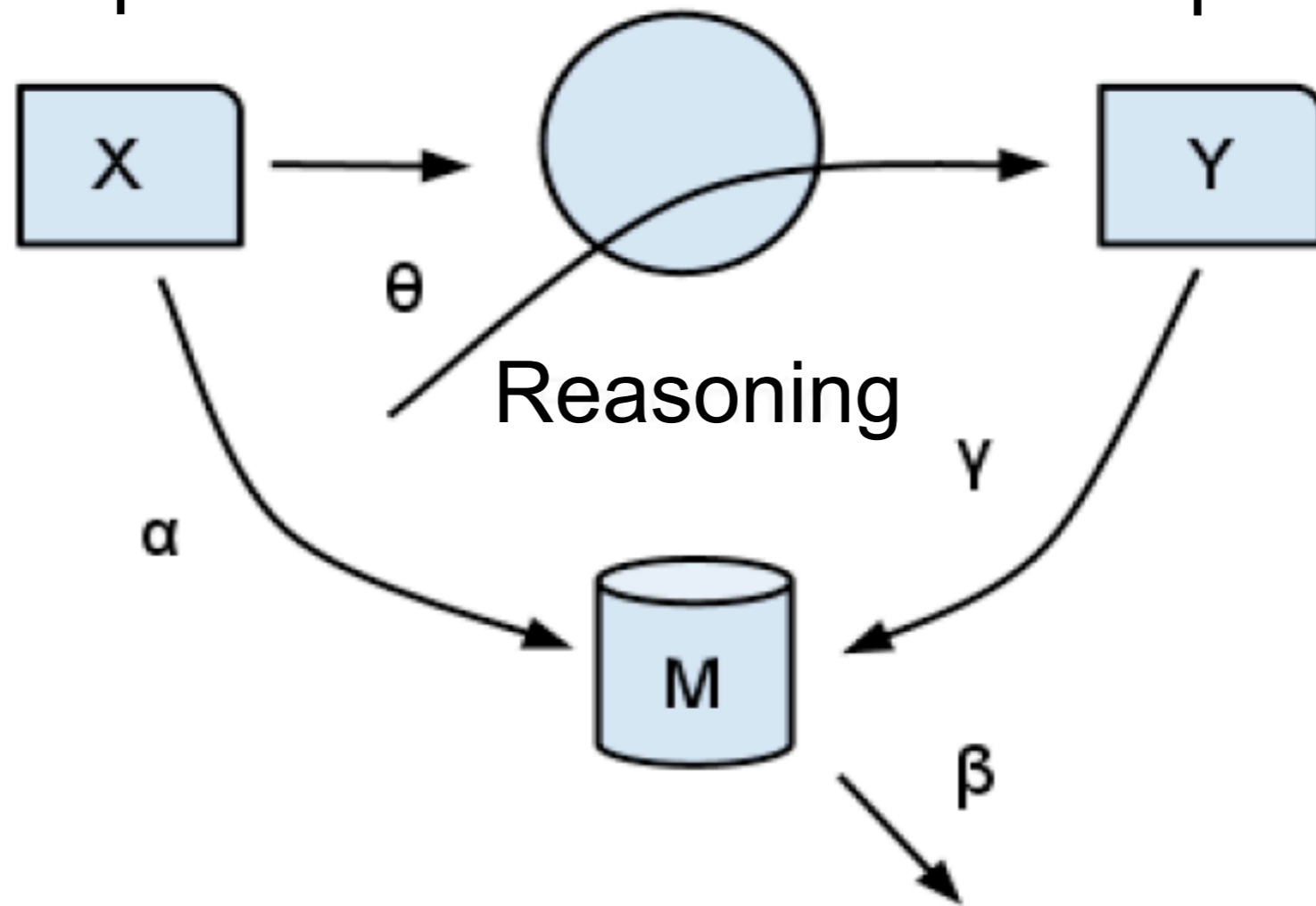
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this theory allows a definition of collective intelligence as the property of social structure

individuals can. This property amplifies if the social structure improves its synergy. The definition covers both cases when *C-I* results in physical synergy or in logical cooperative problem-solving.

Input

Output

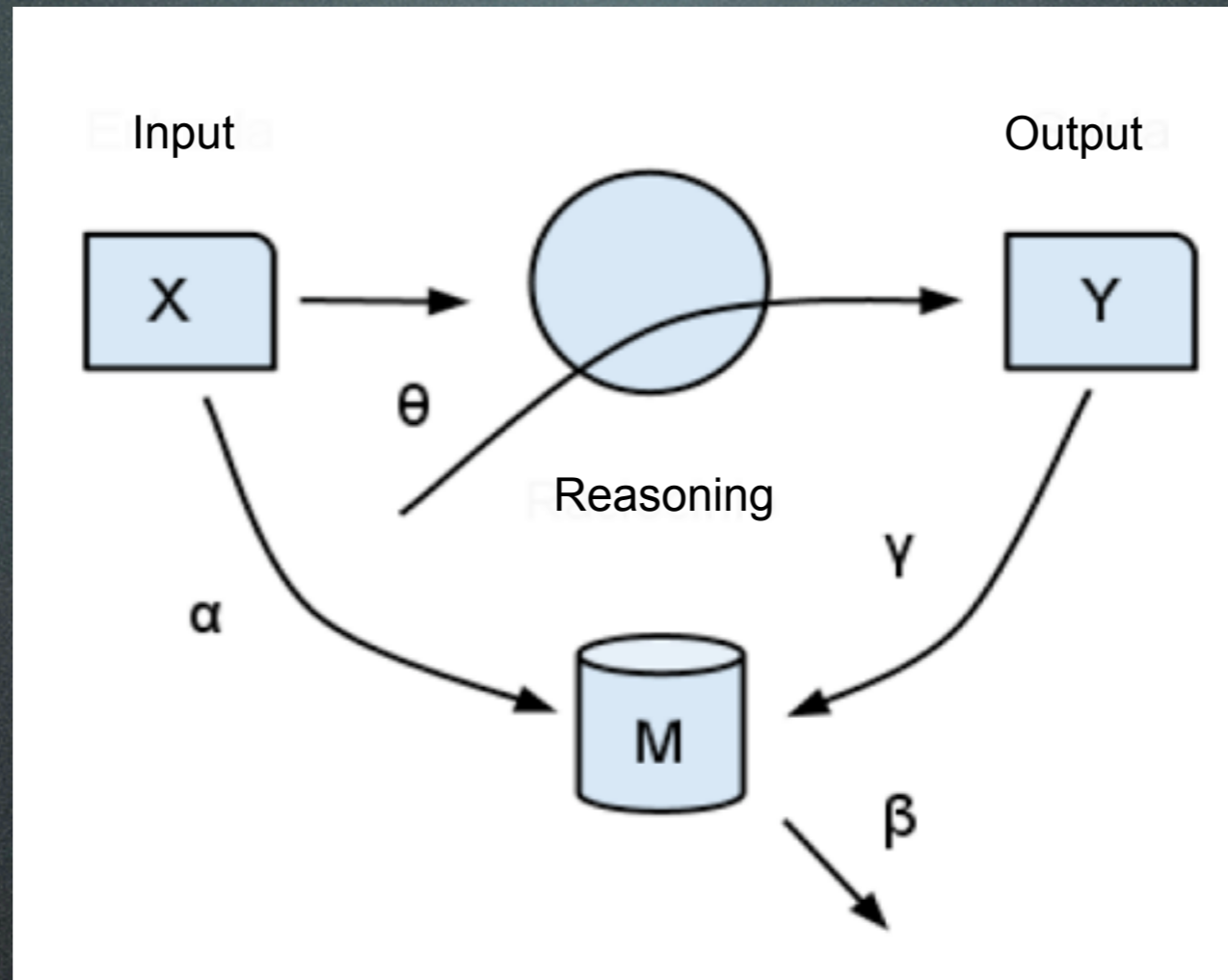


$$H(X) = - \sum_{x_i \in X} p(x_i) \log p(x_i)$$

$$H(X) = - \sum_{x_i \in X} p(x_i) \log p(x_i)$$

$$H(Y) = - \sum_{y_i \in Y} p(y_i) \log p(y_i)$$

$$H(M) = - \sum_{m_i \in M} p(m_i) \log p(m_i)$$



$$p(x_i) \leq \alpha : m_i = x_i$$

$$p(x_i) \leq \theta : y_i = x_i$$

$$p(x_i) > \theta : y_i = m_i$$

$$p(y_i) \leq \gamma : m_i = y_i$$

$$p(m_i) > \beta : m_i = \phi$$

$$H(Y) = - \sum_{y_i \in Y} p(y_i | y_i = x_i) \log p(x_i) - \sum_{y_i \in Y} p(y_i | y_i = m_i) \log p(y_i)$$

$$H(M) = - \sum_{m_i \in M} p(m_i | m_i = x_i) \log p(m_i) - \sum_{m_i \in M} p(m_i | m_i = y_i) \log p(m_i)$$

$$H(Y) = - \sum_{x_i \in X_\theta} p(x_i) \log p(x_i) - \sum_{x_i \in X_{\bar{\theta}}; y_i \in Y_\gamma} p(x_i)p(y_i) \log p(x_i)p(y_i)$$

$$H(M) = - \sum_{x_i \in X_\alpha} p(x_i) \log p(x_i) - \sum_{x_i \in X_{\bar{\theta}}; y_i \in Y_\gamma} p(x_i)p(y_i) \log p(x_i)p(y_i)$$

$$H(Y) = H(M) + \sum_{x_i \in X_\alpha} p(x_i) \log p(x_i) - \sum_{x_i \in X_\theta} p(x_i) \log p(x_i)$$

$$H(Y) = H(M) + H(X_\theta) - H(X_\alpha)$$

ciencia■

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