

BAYESIAN MODELLING FOR SEMANTIC COMMUNICATION

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Abstract

The modern communication systems, are managing huge volumes o data, like images, voice/sound, video, process measurements or results of simulations. Applications are in all major fields of science; e.g. medical image and data archives, multimedia systems, the management of remote sensing data, etc. One of the main problems encountered in the design of such systems is the semantic gap between the diversity of semantic meanings that users desire to recognize in the data and the low level of the content descriptions used for indexing the data information contents.

The article presents an advanced communication concept for augmentation of the data with meaning, it may be interpreted as a data coding task which includes the model of user understanding. Thus the scope of the data coding is enlarged up to the semantic of the messages, including the adaptation to the user conjecture. In figure 1 is presented the simplified diagram of the communication system.

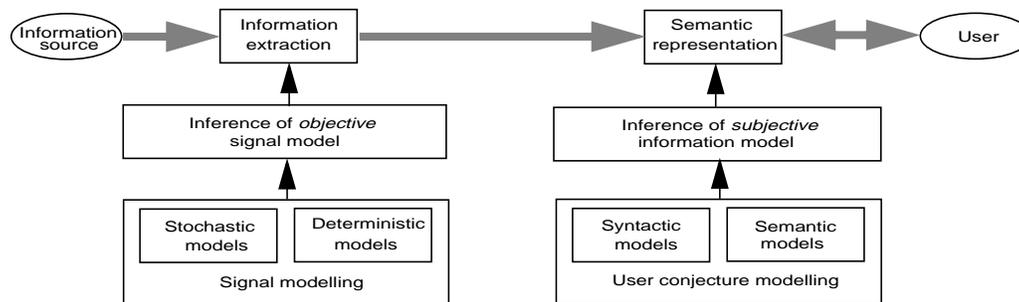


Fig. 1: Simplified diagram of a modern communication system

The information source is assumed to be a *collection* of multidimensional signals, or data. The information retrieval (communication) process is spitted up in two steps: i) objective information extraction and, ii) semantic representation. The objective information extraction requires the signal or data modelling. The Bayesian hierarchical models are used. A library of stochastic and deterministic models is used to infer the signal model. The information extraction is a model fitting task. The resulted objective features are interpreted according to the user conjecture. Thus the semantic coding is a Bayesian learning process based on a man-machine dialog, The coding process relies on restructuring the signal or data feature space according to the user semantic models.

Key Words: Bayesian modelling, inference, information theory.