

Chapter 5

A Semantic Model to Address Health Questions to Professionals in Healthcare Social Networks

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ABSTRACT

Internet social networks offer a wide variety of possibilities, including communication between users, sharing information, and the creation of virtual communities on many different subjects. One of these subjects is healthcare, where different social networks are now appearing and covering different objectives. In this chapter, a social network is described, where users can formulate healthcare questions that are automatically classified under concepts of a medical ontology and assigned to experts of each topic. These questions are then answered by healthcare expert physicians. This chapter includes a semantic classifying method that provides the automatic classification of questions by means of a medical ontology, based on the tags used to annotate them, and the previously classified questions. The chapter includes an ontological model that represents the questions, the assigned tags, the answers, the physicians, and the medical concepts.

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INTRODUCTION

Nowadays, we assist to the emergence of different social networks based on some of the features offered by Web 2.0 technologies. Users of social networks are the main actors in this kind of webs: creating new content that are accessible to other users of the Web, interacting with other users, creating relationships, and defining, in a great extent, the evolution of these networks.

Healthcare social networks (HSNs) provide new social and commercial possibilities. They provide new communication and interaction channels among patients and physicians, they provide new healthcare services, and offer new business trends.

There exist many ways to apply social networks to the healthcare field:

- i) Patients sharing their own treatment experiences with other patients (PatientsLikeMe¹).
- ii) Physicians retrieving knowledge by reading medical literature and interacting with peers (Sermo², PeerClip³, Within3⁴).
- iii) Medical students, residents improving their knowledge (knowledge discovery and collective wisdom) (SocialMD⁵).
- iv) Online support groups (MDJunction⁶);
- v) Rating physicians (RateMDs⁷).
- vi) Physicians and patients sharing experience both together (WegoHealth⁸). HSNs concern patients (iMedix⁹), physicians (Sermo, PeerClip, Within, SocialMD, Ozmosis¹⁰), students (SocialMD, Tiromed¹¹, DOctorsHangout¹²) and nurses (Nursing World¹³, Nurselinkup¹⁴).

From the **physician** point of view, healthcare information is hierarchical and formally well classified by means of **ontologies**. Healthcare terminologies like SNOMED¹⁵, openGalen¹⁶, MeSH¹⁷, UMLS¹⁸ or ICD¹⁹ are used in healthcare environments for different purposes as clinical history encoding, statistical analysis of medical

activities and procedures, etc. These terminologies are often lengthy and complicated to use even for healthcare professionals, and of course very complex and often unintelligible to be used by common users of social networks without healthcare knowledge. In this sense, **folksonomies** (Vander Val, 2007) provide an easier way to create, browse and search information since they are less restrictive and rigid than the medical terminologies.

One of the more interesting features of this kind of social networks is that users can address questions concerning their health directly to medical specialists, and also to patients with similar pathologies (a way to share experiences). The main problem is the difficulty addressed to **question** classification. Users classify healthcare questions easily by means of **tags**, but this produces fuzziness in the classification. The classification of tags using folksonomies is less strict than that obtained with other more formal methods like **ontologies**. Therefore, there not exists any kind of general classification criteria. Users tag their questions following their own medical knowledge (often limited). This makes navigation among the questions difficult, since other users (i.e. medical specialists) must browse and search the questions using the limited capabilities of folksonomies.

Our contribution concerns the semantic model used to solve the addressed problem of automatic assignation of health questions from patients to physician professionals in HSNs. Our proposal includes the generation of a **folksonomy** from the user's questions and the assigned tags, and the modelling of this folksonomy using some existing ontological models. We model the folksonomy using Social Semantic Cloud of Tags (SCOT²⁰) and we extend the SCOT's model using: i) Semantically-Interlinked Online Communities (SIOC²¹), in order to represent the different elements of the HSN and its behaviour; and ii) Simple Knowledge Organisation System (SKOS²²), in order to define the ontology containing the set of necessary healthcare topics used in the clas-

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