**TCSN Newsletter –Issue Nine– June 2022**
***Social Networks Technical Committee***
Editor: Dr. Anna Maria Vegni

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# SPECIAL INTEREST GROUP ON SOCIAL INTERNET OF ANYTHINGS

On late 2021, the Special Interest Group on Social Internet of Anythings (SIG SIoA) of the IEEE Technical on Social Networks (TCSN) was created in response to the need of address specific topics of TCSN. Specifically, the SIoA SIG promotes research and development in emerging area of social networking applied to communication networks, ranging from traditional IoT networks, including Internet of Vehicles, Internet of Flying devices, Internet of Medical devices, till Internet of People, where social features are relevant and exploitable for communication and networking purposes.

Due to this huge application field, not limited to IoT, and since social aspects can find applicability in different fields, we extend the definition of Social IoT to Social Internet of Anythings. In this context, we are aware that new threats can emerge and make the SIoA more vulnerable to cyber attacks. The SIoA will focus on reserach activities on all these aspects. SIoA SIG aims to provide a platform for researchers and practitioners from academia and industry to discuss relevant topics and exchange views on the important issues of SIoA provisioning, social networking and connectivity, social community detection and prediction, social ties and hub nodes for communication networks, cross-layer design and inter-operability between communication networks and social networks. It will also assist the TCSN by organizing and supporting ComSoc-sponsored conferences and workshops, special issues and feature topics of relevant journals.

More information can be found at the following link: https://sn.committees.comsoc.org/special-interest-groups-sigs/

## *LOGO CREATION CONTEXT*

The SIG SIoA Chairs have advanced in the definition of a logo that better depicts the main topics covered by the SIG. A Logo Creation Contest initiative has been suggested in order to involve all the interested members of TCSN, especially students and post-docs, to send their logo design idea directly to the SIG SIoA chairs (annamaria.vegni@uniroma3.it, valeria.loscri@inria.fr).

The SIG SIoA Chairs will select the best, most appropriate and suitable logo, whose creator will be awarded of a free registration to the 1st International Workshop on Social Internet of Anythings (https://sn.committees.comsoc.org/call-for-papers/the-1st-international-workshop-on-social-internet-of-anything-sioa22/), in conjunction with IEEE WiMob 2022.

### *1ST AND 2ND INVITED TALKS*

Among the main initiative of SIG SIoA, we aim to provide a series of invited seminars about topics of interest for our SIG. At today, we had the first two invited talks. More details can be found at the SIG webpage: https://sn.committees.comsoc.org/special-interest-groups-sigs/

**TALK TITLE:**

Adding social capability to Digital Twins in 5G IoT ecosystems

Prof. Antonio Iera, University of Calabria, Italy

25 February 2022, 4 PM CET

**TALK TITLE:**

Towards the network of the future… with a little help from my friends

Prof. Giacomo Morabito, University of Catania, Italy

29 April 2022, 4 PM CET

# A SOCIAL APPROACH TO IMPROVE TRUSTWORTHINESS AMONG SOCIAL DIGITAL TWINS

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The reason today for the attractiveness of a digital world is tied to the promise of addressing the challenges that the IoT is and will be facing in the near future[1]. One major cause of these challenges is the shift of the current interaction model from that based on humans looking for information provided by objects (human-object interaction), to the object-object interaction. This interaction model will be based on objects looking for others to provide composite services for the benefit of humans, increasing the interaction complexity. Such complexity will be even higher keeping into consideration the ever-increasing variety of objects and technologies involved, and the even more rapid increase of the range of possible

[1] Khan, Latif U., et al. "Digital-Twin-Enabled 6G: Vision, architectural trends, and future directions." *IEEE Communications Magazine* 60.1 (2022): 74-80.

applications. To efficiently enable the aforementioned properties of xG wireless systems, major IoT platforms have introduced their vision of a digital twin as a digital counterpart of the real entities, with the fundamental role to bridge the gap between the physical and the digital worlds. A digital twin is a virtual representation of the elements and dynamics of a physical system.

With such an interaction model, it is essential to understand how the information provided by each digital twin can be processed automatically by any other peer in the system. Regardless of the considered scenario, from economic to social and technological applications, the concept of trust is of utmost importance, since it represents the degree of risk perceived by an entity during a collaboration: if the risk is too high, it means there is no trust between the parts, there is no incentive to enter a relationship and thus any form of cooperation is not feasible. This means that cooperation between users and news publishers can only be effective if there is trust between them and so news can efficiently circulate.

Trust is tied to the concept of reputation. Indeed, trust can be gained on both direct and indirect bases, but in large networks, it takes time (sometimes, too much time) for an entity to collect enough direct experience, so an entity has to rely on the perception of other entities, that is the reputation. Through reputation, it is possible to collect, distribute and aggregate feedback about participants' past behaviour and then provide a global perception of an entity. This concept is important for digital twins interacting with one another so that they do not need to apply a try and error approach to discover reliable sources, but they can rely on the reputation collected by the community.

Although we experience and rely on trust during our interactions in everyday life, trust can have many definitions so it is challenging to define it accurately. The literature on trust is also quite confusing since it manifests itself in fairly different forms. In this paper, we adopt the following definition of trust:

> *Trust is the subjective probability by which an individual, the trustor, expects that another individual, the trustee, performs a given action on which its welfare depends*[2].

**A common solution: social digital twin**

An approach, which is recently gaining increasing popularity and has the potential to properly address this issue, is based on the exploitation of social networking notions into the IoT, as formalized by the Social IoT (SIoT) concept[3]. According to this vision, digital twins create relationships among themselves as humans do: this approach introduces the vision of social relationships among different devices so that they are more willing to collaborate with friends with respect to strangers. This is expected to make the exchange of information and services among different devices easier and to perform the identification of malicious nodes by creating a society-based view of the trust level of each member of the community.

When it comes to the IoT paradigm, the idea is to exploit social awareness as a means to turn communicating objects into autonomous decision-making entities. The new social dimension shall, somehow, be able to mimic interactions among users and motivate a drift from an egoistic behaviour to altruism or reciprocity. The main principle is to enable digital twins to autonomously establish social links

[2] Gambetta, Diego. "Can we trust trust." *Trust: Making and breaking cooperative relations* 13 (2000): 213-237.
[3] Atzori, Luigi, et al. "The social internet of things (siot)–when social networks meet the internet of things: Concept, architecture and network characterization." *Computer networks* 56.16 (2012): 3594-3608.

with each other (by adhering to rules set by their owners) so that "friend" objects to exchange data in a trustworthy manner.

According to this model, a set of forms of socialization among digital twins is foreseen. The parental object relationship (POR) is defined among similar objects, built in the same period by the same manufacturer (the role of the family is played by the production batch). Moreover, objects can establish a co-location object relationship (CLOR) and co-work object relationship (CWOR), like humans do when they share personal (e.g., cohabitation) or public (e.g., work) experiences. A further type of relationship is defined for objects owned by the same user (mobile phones, game consoles, etc.) that is named ownership object relationship (OOR). The last relationship is established when objects come into contact, sporadically or continuously, for reasons purely related to relations among their owners (e.g., devices/sensors belonging to friends); it is named social object relationship (SOR). These relationships are created and updated based on the objects' features (such as type, computational power, mobility capabilities, brand, etc.) and activities (frequency in meeting the other objects, mainly).

**What's Next?**

The creation of a social network among all the digital twins supporting IoT applications, as an overlay infrastructure that is exploited to foster trustworthy and effective interactions, following the SIoT paradigm. Groups of entities with common interests are created to exchange information about events of common interest for the implementation of the services required by the IoT applications. By exploiting the functionalities of the SIoT paradigm, a trustworthy view of these groups is created, which is then exploited to detect events and trigger actions needed to improve the user experience.