🏆 *reviewed paper*

Intelligent Social Network

Pietro Elisei, Darinka Golubovic-Matic, Pierre Laconte, Vasily Popovich, Tatiana Popovich, Manfred Schrenk, Vladimir Shutkov, Artem Zagvozdkin

(Dr. Eng. Pietro Elisei, EEC UIA Programme International Expert, Bucharest, Romania, pietro.elisei@urbasofia.eu)
(PhD, Union Nicola Tesla University, dgolubovicmatic@unionnikolatesla.edu.rs)
(Pierre Laconte, President, Foundation for the Urban Environment – FFU, pierre.laconte@ffue.org)
(PhD Vasily Popovich, HTRD Ltd., vp617616@gmail.com)
(PhD Tatiana Popovich, HTRD Ltd., bonixpavlova@gmail.com)
(Dipl.-Ing. Manfred Schrenk, CORP – Consulting Research Projects DI Manfred Schrenk KG, Schwechat, Austria, schrenk@corp.at)
(Vladimir Shutkov, HTRD Ltd., v-shutkov@gmail.com)
(Artem Zagvozdkin, HTRD Ltd., z.artem@gmail.com)

1 ABSTRACT

Recently emerged social networks are gaining momentum and are becoming an integral part of modern life. The introduction of artificial intelligence methods, such as ChatGPT, show the importance of this field of science in computer technology, science and social life.

With more than 20 years of experience in the application of AI methods, we consider it appropriate to share ideas for their application in the interests of everyday human activities. Our main proposal concerns the creation of decision support systems based on social networks, localized in the interests of a particular person.

The main technologies that we apply are the following: Scenario Approach, which includes the Ontology System, Inference Machine, a Visual Integrated Development Environment, and a number of mathematical approaches that implement machine learning and DSS. First of all, these are: Singular Value Decomposition and Method of United Randomize Indices. Unlike neural networks, these methods have a clear mathematical interpretation and controlled accuracy. Also for their application there is no need for very large statistics.

Keywords: Intelligent Social Network, Artificial Intelligence, Inference Machine, Ontology, Scenario Approach

2 INTRODUCTION

The earliest online social networks appeared almost as soon as the technology could support them. E-mail and chat programs debuted in the early 1970s, but persistent communities did not surface until the creation of USENET in 1979 [17]. USENET began as a messaging system between Duke University and the University of North Carolina, but it rapidly expanded to other American universities and government agencies. USENET allowed users to post and receive messages within subject areas called newsgroups. Initially, there was no standard convention for the naming of newsgroups [17]. This led to confusion as the number of newsgroups grew throughout the 1980s. In 1987 USENET groups were reorganized into broad hierarchies such as news, talk, misc (for miscellaneous), and alt (for alternative; the last was created for newsgroups that dealt with taboo or niche topics, and it was the most populous category on USENET) [17].

The first companies to create social networks based on Web technology were Classmates.com and SixDegrees.com, Classmates.com, founded in 1995, used an aggressive pop-up advertising campaign to draw Web surfers to its site [17].

Others were quick to see the potential for such a site, and Friendster was launched in 2002 with the initial goal of competing with popular subscription-fee-based dating services such as Match.com. [17]. It deviated from this mission fairly early on, and it soon became a meeting place for post-"bubble" Internet tastemakers [17]. The site's servers proved incapable of handling the resulting spike in traffic, however, and members were faced with frequent shutdowns [17].

Overview of social networks. The statistics for 2023 show that there are 4.48 billion active social media users worldwide [18]. Let us note the most popular and well-known social networks and give them a brief description.

LinkedIn – more than 700 million active users per month. This professional networking site is great for B2B marketing. The audience on LinkedIn focuses on sharing professional content instead of personal. It is useful for professionals in various subject areas [18].

Facebook – around 3 billion active users per month. Easily the most popular platform on our list, Facebook is where you'll find most social media users actively engaging with brands [18].

It doesn't just allow you to connect with your peers; you can also use Facebook to sell your products through Facebook Shops and promote your brand through Facebook Ads. It's also a favorite among businesses, as reports show that approximately 70% of brands find new customers through Facebook [18].

Instagram – around 1 billion monthly active users.

Owned by Facebook, this app-based platform is a must for brands prioritizing Influencer Marketing. With features like Instagram Stories, IGTV, and Instagram Live, marketers can make the most of video content to engage with their audience [18].

Creating a business profile will let you integrate Instagram Shopping and Insights too [18].

YouTube – Monthly Active Users: 2.3 billion Currently the second-largest global search engine, YouTube is a pot of gold for content creators. If video marketing is your thing, don't miss out on this platform [18].

Brands can add YouTube advertising to their social strategy and share quality content easily across the globe. Stick to the community guidelines, and you'll not connect with your audience but also monetize your videos in no time [18].

TikTok – Monthly Active Users: 1 billion. Still new to the social scene, ByteDance's TikTok has garnered a huge user base since its inception in 2016. If your target demographic includes Gen Z, you have to master this application [18].

It's easy to go viral on TikTok, but that's also why the social platform is heavily saturated [18].

Telegram – Monthly Active Users: 500 million. A secure messaging application, Telegram can be used to create chatbots, broadcast messages to the audience, and provide customer support [18].

Brands can create large group chats (for around 200,000 members) to announce launches or simply interact with their audience [18].

Founder Pavel Durov has plans to introduce Telegram's ad platform soon [18].

Twitter – Monthly Active Users: 353 million Twitter has surprisingly lesser users when compared to other networks on this list. However, that doesn't mean that it isn't influential. In fact, 54% of users have taken action after seeing the brand mentioned on Twitter [18].

Using ads, integrating customer service, and growing an active customer following. You can do all of this with Twitter [18].

WhatsApp – Monthly Active Users: 2 billion. Originally created for connecting with family and friends, this platform now offers a WhatsApp Business application and WhatsApp Business API to create business profiles [18].

Brands can showcase their catalogs and offer quick customer service through this messaging application. That's not all. Unlike most messengers, WhatsApp is ad-free [18].

3 ADVANTAGES AND DISADVANTAGES OF SOCIAL NETWORKING

Just as the invention of the revolver (pistol) at one time created the illusion of human equality, so the widespread use of the Internet and social networks (SN) created the illusion of informational equality and freedom, social justice. Each person can become almost instantly widely known to the world audience without the need to wade through social steps, filters, often without wasting time on education and development of real creative principles in oneself. And this is a kind of "trap" of social networks, when the whole point is to collect likes from social pseudo-friends.

Social networking can affect individuals and corporations positively and negatively. That is why it is important to weigh the advantages and disadvantages of using these social media sites before getting too heavily involved. Various analysis variants can be found on the Internet. One of them is shown below.

3.1 Advantages [12]

- Social networking allows individuals to make and stay in contact with family and friends that distance and lost connections would otherwise prohibit.

440

REAL CORP 2023: LET IT GROW, LET US PLAN, LET IT GROW
Nature-based Solutions for Sustainable Resilient Smart Green and Blue Cities

- People can also connect with unknown individuals who share the same interests and develop new relationships.

- Social networking also allows companies to connect with new and existing clients.

- Companies can create, promote, and increase brand awareness through social media.

- Companies can capitalize on customer reviews and comments promoting products, services, and brands. The more customers post about a company, the more valuable the brand authority can become. This can lead to greater sales and a higher ranking by search engines.

- Social networking can help establish a brand as legitimate, credible, and trustworthy.

- Companies may use social networking to demonstrate the quality of their customer service and enrich their relationships with consumers. For example, if a customer complains about a product or service on Twitter, the company may address the issue immediately, apologize, and take action to make it right.

3.2 Disadvantages [12]

- Social networking can facilitate the spread of misinformation about individuals and companies.

- Due to its online nature, falsehoods can spread like wildfire. This became increasingly prevalent after 2012. One study found that misinformation is 70% more likely than factual information to be shared on Twitter.

- The detrimental impact of misinformation can create a virtual headache for a company's public relations (PR) department.

- The anonymous aspect of newfound personal relationships requires caution.

- Building and maintaining a company profile takes hours each week. Costs add up quickly.

- Businesses need many followers before a social media marketing campaign starts generating a positive return on investment (ROI). For example, submitting a post to 15 followers does not have the same effect as submitting the post to 15,000 followers.

3.3 Purpose of Social Networking

Social networking connects individuals and businesses by allowing them to share information, ideas, and messages. Companies also use social networks to create and strengthen brand recognition, promote products and services, and answer customer queries and concerns [13].

3.4 Benefits of Social Networks

The benefits of social networks include their ability to help people connect and stay in touch with family, friends, and new contacts; the opportunity they offer businesses to market their brands; their ability to spread useful, even vital, information instantly to individuals and institutions [13].

3.5 Importance of Social Networks

Social networks are important because they allow people to develop relationships that might not be possible due to distances of place and time. They also help boost business productivity when used for public relations, marketing, and advertising purposes [14].

4 ARTIFICIAL INTELLIGENCE FOR SOCIAL NETWORKS

Before moving on to our AI-related technologies, let us look at a typical algorithm for creating a social network, which can be easily found on the Internet:

a. Set your networking goals [15,16]

To help navigate through the networking process and to ensure you're using your time and resources wisely, set goals for yourself. Decide what you aim to accomplish by connecting with industry professionals. Potential reasons to build your network could be to gain job opportunities, enhance your industry knowledge or receive career advice.

b. Craft a compelling elevator pitch [15]

Before you meet with any professionals, have an elevator pitch prepared, which is a 30- to 60-second speech mentioning your strengths, value and background. If you're networking for potential job opportunities, emphasize your value and why you'd make a great fit for a company.

c. Reach out to current connections [15]

No matter where you are in your professional journey, you should already have a network. Contact people you know who could help you advance in your career. These can be friends, classmates, current or previous co-workers, family members or colleagues. Cultivate and grow these relationships by reaching out to them directly or connecting on social media.

d. Join local and national organizations [15]

Expand your network further by finding local and national organizations in your industry that interest you. Conduct research and make a list of potential organizations that appeal to you and align with the networking goals you set for yourself. Consider organizations targeted both toward where you currently are in your career and where you aim to be, such as groups for entrepreneurs, remote employees or business-to-business professionals.

f. Use social media to find new connections [15]

You can use social media to locate and reach out to potential connections. It's also a great solution to start out with if you're anxious to attend events and talk in person. Connect with industry professionals who hold similar values, aspirations and interests as you. Send a message to them that briefly outlines who you are and why you'd like to connect.

Continue your communication with them by commenting on posts or maintaining a casual conversation back and forth through social media. Once you establish a professional online relationship with them, you can feel more comfortable meeting them in person one day.

g. Attend industry events [15]

Many of the organizations you join may often host industry events. Attend these gatherings to meet some of your online connections in person. Some of these may be educational events or classes to help learn a new skill or develop your abilities. Try to meet new people regularly at these events and make as many connections as possible. You can also research industry events online to find those happening in your area, like conferences, conventions or seminars.

The algorithm for creating a social network recommended above (on the Internet) is focused primarily on business development. Meaning that the SN is created to support of an existing business, or to be exact the SN is created as a business itself. Here we consider the SN as a type of business aimed, first of all, at meeting the needs of the individual, and, in particular, to support the various kinds of decision-making in everyday life, including in business. At the current time, we do not consider ISN as a tool in the interests of business companies, but such an application is not excluded.

4.1 Main technologies of artificial intelligence

Our history of development and application of these technologies counts more than 20 years. Based on these technologies, maritime transport monitoring systems and decision support systems have been developed and are being successfully produced. The good example is the integration of DMSS in the Smart City project [1]. In our opinion, these technologies can be successfully applied in the intelligent social networks. In this case, their main focus is an ego-centric approach to a particular person, regarded as the main element of society. There is an obvious contradiction here, but we will not consider it in this article. Let us briefly review the technologies we offer.

4.1.1   Scenario Approach

The scenario approach has been described in detail in our previous publications. It has hardly changed, except for the development tools. The main difference is that instead of the Protege system, we have developed our own ontology system and a lower-level Scenario editor based on the Drools logic programming language built into the IntellIdea software development environment. The Scenario system is developed based on a client-server architecture, as a web-client. The Rete Inference Machine is part of the

Drools language. With the use of the scenario system, the main business analytics of the individual is described. Basic scenarios are created by experts and can be used as prototypes. Basic scenarios can also be generated automatically if there is a sufficiently complete source statistics.

4.1.2 Machine learning tool and a classifier

It is based on the Singular Value Decomposition (SVD) and the Method of United Randomized Indices (URI), which are also applied in almost all of our flagship products. The essence of these approaches is also described in detailed in our previous publications.

This toolkit can be used on the principle of neural networks application, processing huge amounts of data, and can be used on the basis of a repository formed by experts. Both options are possible, when at the first stage the experts' repository is used, and in the process of work the repository is corrected based on self-learning. This is one of the important advantages of SVD and URI over machine learning methods based on neural networks and similar approaches.

5 DECISION MAKING SUPPORT SYSTEM FOR SOCIAL NETWORKS

The most important element of ISN from the point of view of the user, or network member, is decision support in various situations. Any decision is made in case of availability of information. First of all, there are the following base classes: the decision maker itself, his goals, thoughts, ideas that should be maximallty clearly defined, the environment in a broad sense of the term, available resources and many different kinds of natural and artificial obstacles and restrictions.

The basis of any DMSS is the so-called. "management cycle", consisting of a number of fundamental stages:

- an intention (primary idea, desire or some challenge);

- suggestions (additional information that allows you to clarify the intention and form it as a task or a goal);

- a decision (a clearly formulated goal of actions, that takes into account various factors and restrictions, with various qualitative and quantitative assessments of various kinds);

- a plan (spatio-temporal assessment of achievement of a clearly formulated goal in the decision, the sequence of steps (actions) to achieve the goal;

- implementation of the plan (implementation of the plan, assessment of each stage regarding time, space, resources and trends directed towards achieving the goal, continuous assessment of the feasibility of the plan and its correction if necessary). If at the previous stages of the control cycle (CC) we can set some regulatory time requirements, then the last stage is, as a rule, already a real-time system. And for real systems, CC is the implementation of a situational control system. Definition of situational management or analysis of tactical situations can be found in the specialized literature, as well as in our previous works [2].

To implement the DMSS in the situational management (SM) variant, it is necessary to have an appropriate initial level of information and online access to the necessary information. All information and basic entities must be formalized. The first level of formalization is a system of ontologies, which describes non-overlapping sets of subject areas that interact with each other. The most complex ontology is the ontology of the individual using the ISN. This is due to an obvious contradiction: the need to formalize and enter personal data, on the one hand, and, on the other hand, ensure the confidentiality of personal data. Two groups of individual data are very important: static, or "a profile" of an individual [5], dynamic, or "a trace" of an individual [5]. This problem has a number of solutions and is not fatal, but depends on many factors. In this article, we will not consider this problem.

The second level is the development of business analytics for the selected abstractions of the ontology system. In fact, this is the implementation of the SM. The third level is the circulation of data, information and knowledge in the control loop. As the basis one can use the JDL model [12], which we also considered earlier in a number of papers regarding DMSS.

We expect that in our next paper a version of the working prototype will be presented.

6 CONCLUSIONS

The proposed version of ISN, in fact, can be an add-on over one of the versions of existing networks. For example, Telegram bot can used. In the proposed approach, it is not the SN itself that is important, but the ability to provide decision support using AI tools and methods. The Internet and a typical SN are used as an environment, an entourage in which the existence of an ISN add-on is possible.

At the moment, the development of a prototype of ISN is underway. Several subject areas have been selected, in which individual decision support will be provided. We also justify the localization of ISN data in order to solve the age-old problem of confidentiality with purpose to avoid "the Big Brother looking over one's shoulder". At the same time, this problem is solved not only and not so much by localization, but mostly by the development of a special technology that allows you to avoid external interference with individual data, information and knowledge without the knowledge of their owner.

We are also considering the involvement of general public, both organizations and individuals, in this venture project on a pro bono basis.

7 REFERENCES

[1] Pietro Elisei, Vasily Popovich, Manfred Shrenk, Oksana Smirnova, Tatiana Popovich. Smart City and Digital Humanities. CORP 2022, 14-16, November, 2022 Vienna, Austria.
[2] V.V. Popovich, G.L. Zykov, A.A. Rimashevsky, O.V. Smirnova, M.V. Tsvetkov, T.V. Popovich. Knowledge centric approach in information systems. //Marine Radio Electronics. #4 (74), pp. 10-16. December, 2020. St. Petersurg.
[3] V. Popovich, T. Popovich, O. Smirnova. Intelligent Decision Making Support System for Smart City Governance and Management. Proceedings of the ISAECT Conference, Roma, Italy. 27-29 Nov. 2019. Inspect Association Number: 19536136.
[4] P. Elisei, V. Popovich, M. Schrenk. CRISALIDE. Concept of Corporative Information System Governance and Management of Digital City. Corp 2019, 12-14, April, 2019 Karlsruhe, Germany.
[5] Popovich, V., at all. Intelligent Decision-Making Support System with Regard to Anti-terrorist Activity in Harbor and Coastal Waters // Proceedings of WSS2008, Copenhagen, August, 2008.
[6] Popovich, V., Hovanov, N., Hovanov K., Schrenk, M., Prokaev, A., Smirnova, A. Situation Assessment in Everyday Life // Proceedings of CORP2008, Edited by Manfred Schrenk, Vienna, May 19-22, 2008.
[7] Tarakanov A.O., Skormin V.A., Sokolova S.P. Immunocomputing. Principles and applications, Springer, 2003.
[8] Hovanov N., Kornikov V., Seregin I. Randomized synthesis of fuzzy sets as a technique for multi-criteria decision making under uncertainty // Proceedings of the International Conference "Fuzzy Logic and Applications". Zichron Yaakov (Israel), May 18–21, pp. 281-288, 1997.
[9] Hovanov N., Fedotov Yu., Zakharov V. The making of index numbers under uncertainty // Environmental Indices: Systems Analysis Approach. Pykh Yu., Hyatt D., Lenz J. (eds.). Oxford (UK), EOLSS Publishers Co.1999.
[10] Charles Forgy, Rete: A Fast Algorithm for the Many Pattern/Many Object Pattern Match Problem, Artificial Intelligence, 19, pp. 17-37, 1982.
[11] Holger Knublauch, An AI tool for the real world. Knowledge modeling with Protégé, JavaWorld.com, 06/20/03.
[12] Das, S. (2008). High-Level Data Fusion. Norwood, MA: Artech House Publishers. ISBN 978-1-59693-281-4.
[13] Daniel Hampton How does your networking status affect your career? 2022-10-06 URL: https://www.dot.net.au/how-does-your-networking-status-affect-your-career
[14] Ellen Moore What is network society? 6 July 2023 URL: https://istanbulbear.org/what-is-network-society-3908
[15] Indeed Editorial Teem 7 Tips for Building a Strong Professional Network April 8, 2023 URL: https://www.indeed.com/career-advice/career-development/building-networking
[16] Indeed Editorial Teem The Benefits of Networking: 14 Reasons To Start Your Network July 22, 2022 URL: https://www.indeed.com/career-advice/career-development/benefit-of-networking
[17] Michael Ray Social Network. From USENET to 21st-century social networks February 3, 2011 URL: https://wwwkunblog.blogspot.com/2011/02/social-network.html
[18] Chandraveer Singh SocialPilot 20+ Most Popular Social Networking Sites in 2023 July 5, 2023 URL: