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## Nullity Of Cold Start Problem In Recommender Systems: A Study

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### ABSTRACT

Gearing on to initiate for exploration in new horizons many a times poses a little standstill move. The inertia of stillness probably arises due to multifaceted factors such as economic instability, lack of introspection, inability to map various avenues and so on; however, in general there arises no such sphere an individual is ignorant. Somehow a fundamental platform is always present to increment on its future enhancement; it is just a matter of associating various domains and infer out the real prospect in its realm. On that note, one of the open issues of recommender system i.e., cold start is itself undermining the associations lying beneath it. An individual, an item or a community is never a radical invention in its parlance, instead a legacy of the past accommodating the present and unavoidable amendments to surf in present and retain in future. The conducted study represents the view and justifies through various case studies that in real life scenario a new domain are never new in its aspects rather a link of previous ascribed or achieved presence incorporating incremental findings.

**Key words:** Cold start, Recommender Systems, Information flow, Case Studies.

### 1. INTRODUCTION

Traced back the origin of life on Earth, people head towards increased propulsion in their viable environment. This endurance further promulgates the links which a human being can establish unknowingly. Earlier societies were simple with no such documented records of linkages. However, the inherited traits of society and the demographics played a major role in ascribing the attributes required in life tenure. As societies developed and civilized, people started emulating the lifestyle which attracts them the most. This imitation differentiates them with their inherited societal cultures. Thus, different societies impact each other and hence intertwined to emerge a new one. Hence, an inference can be drawn that a new community always has its roots lie in pre-existing communities. Registration of birth is first official record where a newborn imprints their signature. In order to cater their lively and healthier presence, pre-requisites to medical vaccinations are suggested to newborn. Thus develop a medical and a health report of an individual subject to further updates. Besides, a base to knowledge acquisition is also prepared and a progress report generated as per the growing interest of an individual pertaining to any

study. Thus, a potential of future involvement can easily be predicted which can accelerates the directional recommendations in book preferences, employment, research and such kind. Growth of an individual laid its tentacles to other avenues as well, which may include entertainment, attire preferences, food habits, travelling spots, financial behavior, shopping traits and so on. This portrays that an individual is nowhere in solace to practice something new. Indeed, a new is indeed an incremental approach of pre-existing behavior, items already basket, spots created for tourism, ingredients to food intake, financial investments and similar kind. Further these recommendations pace up on an advent of digital atmosphere, a cutting edge wherein a single click is itself an event and adds as a source of data in database and develop an association to precede future intakes.

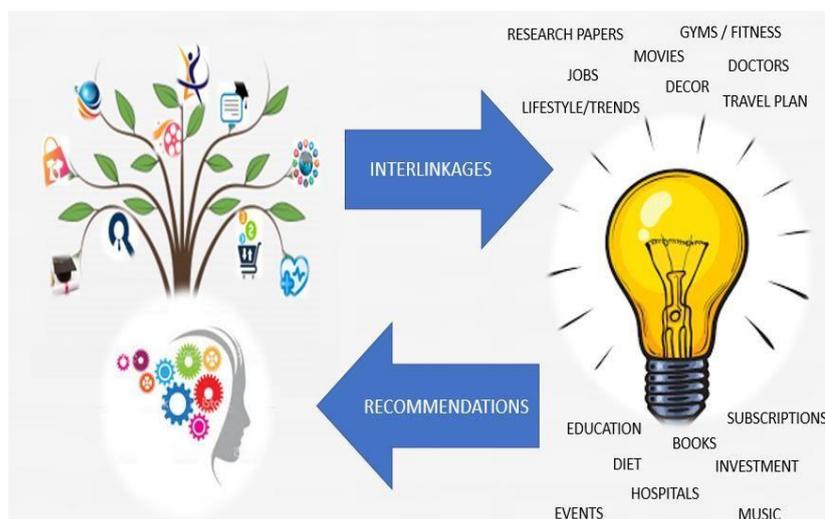


Fig. 1. Information flow in Recommender Systems.

## 2. RELATED WORKS

An interlinking of various domains possesses prediction for future preferences set a potential field to further encroachment in revealing associations. To cater such studies, Cross Domain Recommender System gains its prevalence and contributes to diverse relations. Multiple approaches are put forth incorporating some follows-

- Graph-based approach - A hybrid random walk [1] is proposed to converge the steady state relation within a domain or cross domain in web posts, user labels using direct relations following twitter labels and undirect friendship links on facebook constructing a star structured graph with user at centre.
- Factorization-based approach – A knowledge transfer across cross domain from source to target [2] using user generated tags and item features in movie and book domain develops a matrix factorization based on latent factors sets to recommend.
- Semantics-based approach – Ontologies for facial skin problem and cosmetic problems are built [3] using conversations between user and system, acquiring personalized problem and thus recommending the most weighted cosmetic product.
- Tag-based approach – Correlation among tags for items in cross domain are calculated using association rule mining and nearest neighbour to recommend user preference[4].
- Overlapping entities approach – Partial overlapping in domain shift is eliminated [5] using feature space wherein two overlapping users are placed in common subspace, thus bridging a link across cross domain and measure intra domain alignment to feature space

for future recommendation.

- Hybrid and Cross domain approach - Amalgating hybrid and cross domain recommendation is proposed [6] in predicting items ratings for user and generate user reviews across cross domain by developing latent representations between user and item and words respectively.

The concerned study [7] put forth some of the solutions for addressing cold start problem like active learning in recommender system, semantic-based recommender system, recommendation based on visual features, etc. Active learning is a part of machine learning which involves development and designing of novel algorithms. Semantic based recommender system makes use of the content of items to address new item problem. The study [8] proposes a model for solving a problem in cross domain recommender system where there are no common ratings between different domains by using trust aware recommendation for predicting coarse ratings and then builds a new rating matrix. Collaborative filtering deals with the problem of cold start and to solve this problem cross domain recommender systems are used. The work [9] evaluates and presents different matrix factorization models and makes use of metadata to find a relation between items liked by the users in different domains. The model utilized Linked Open Data to get metadata about the items.

All existing studies try to develop latent relations among cross domain to recommend, which in turn represents that it is possible that cross domain can also be linked in some or other way to determine future domain preferences. This provides us the base to further incorporate such inter linkages and justify our approach in non-existence of cold start issue.

### **3. INFORMATION FLOW**

Information is generated at the very moment a child is born and keeps on generating till the time the person dies. It is present in abundance and can be used from various domains and areas to solve any problem. In a similar way information from different sources can be interlinked and used to handle a problem of coldstart.

When a child is born the information of a child is documented by birth certificate and registration for adhar is also done [10]. When a child attains the age of 5 years the biometric information of a child is updated in adhar. The information of insurance like health policies can also be stored and updated.

The child also enrolls in schools where the information of the student and education is maintained. More information is generated as the he enrolls in different education. By the time the child grows and attains the age of 15 years the information in adhar needs to be updated. Various other information such as bank account details, social media, e-commerce, etc is also generated gradually with time with the involvement in digital world.

After school, the individual enrolls in college where the information of education such as courses, fees, scholarships, etc is maintained. By this time other information like passport/visa, driving license, pan card, bank details like education loan, social media information, job search profiles in various websites, e-commerce data, etc is generated.

By the time the individual gets appointed in a job, information such as bank details, taxes, utility services, property details, property details, etc is generated and maintained which helps in identifying all the financial transactions and ownerships of the individual.

After the individual has attained the certain age and has retired from his job, information about his pension is maintained in the pension portal. In case the individual starts his own business, the entire information can be achieved from the bank.

After death the information of the person's death is documented by the death certificate.

#### **4. CASE STUDIES**

With the advancement of digital platform, the government of India initiated a campaign of Digital India which collects and stores the information of an individual throughout his life cycle. This scheme helps in providing 360-degree information of an individual which is life long, exclusive, authenticable and online [11]. Aadhaar, a 12-digit identification number issued by the government is the primary identity [12] attribute for any individual. This scheme helps in providing the broader view of any individual and has various benefits like efficient delivery of any service, fraud management, etc [11]. With this study we can infer that cold start problem doesn't actually exist, we as an individual inhibit ourselves to a narrow view without inculcating the broad horizon of interlinking prospects.

With the advancement of technology and devices like internet of things and smart meters, real time data can be collected, communicated with other appliance and monitored [13]. This helps the government and companies in getting the information about the users [11]. Study [14] identifies cold start problem in e-commerce due to the lack of information of the user's history. This problem is solved by taking location as a characteristic. The study makes use of the location provided by the user in registration process and selects the users in a particular location and then considers the interest that is common among the users for recommendation for any new user. This method may not be suitable in all cases as the interest of the community might not be same as that of a new user. Instead of taking a narrow view of a particular location, one can consider the broader interests of a user by analyzing the collected data of the user and his activities in various domains and then recommend.

A method discussed [15], tries to solve the cold start problem for new users by making use of opinions of the previous group of users and employing methods of social choice theory. This method helps in collaborating the preferences and reviews of various individuals and reach a collective decision. The study only considers a narrow view of the domain due to which the information of any new user in a particular domain is absent.

The study [16] considers provides a method to recommend the items to the new user. The method proposed is divided into three phases, the first phase classifies the user into specific group, the second phase identifies the neighbors of the new user and the third phase calculates the outcome, i.e. the prediction of user rating is calculated. The presented study again considers the demographic data and only considers a small and narrow domain which leads to new user problem. The problem of new user does not actually exist in a real case scenario if we consider the actual data collected from various domains.

The various methods presented in the study generally considers the similarity of an individual user with other users which may or may not be same and therefore the recommendation provided sometimes may not be relevant. The most efficient method would be to use the user's data from various domains and then interlink them to provide the recommendation.

#### **5. CONCLUSIONS**

Exploring ourselves in cross domain analysis, we struck with the novelty of concluding possibility of non-existence of an issue named cold start, which we believe is rather created than in actual existence. A matter of broad horizon is thus required to inculcate inter linkages across domains and provide a breakthrough in evading initial inertia of standstill. This inertia is thus justified as

ascribed or achieved traits of narrow visions. The information in any regard is no less to determine the future alignment as signature impressions of an individual, item or community inherits its own legacy, it is an incremental approach required to be considered for accommodation and transformation in the real dynamics. Few representations of digital networking and their existing interlinkages in the concerned study prospects its future extrapolation in various domains such as finance, career, legal genesis, and various related utilities.

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