

# Can ChatGPT explain protein interactions better than Knowledge Graphs?

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## Is there an interaction between protransforming growth factor $\alpha$ (TGF- $\alpha$ ) and disks large homolog 2 (DGL2)?

### Literature



Although there is no known interaction between these proteins, there is evidence of an interaction between highly similar proteins [1]: TGF- $\beta$  is regulated by Dlg5 and both proteins activate the MAPK cascade.

[1] Chiara Andolfi, Claudio Tiribelli, Devis Pascut. Recent Hints on the Dual Role of Discs Large MAGUK Scaffold Protein 5 in Cancers and in Hepatocellular Carcinoma. *Front. Biosci. (Landmark Ed)* 2022, 27(5), 164.

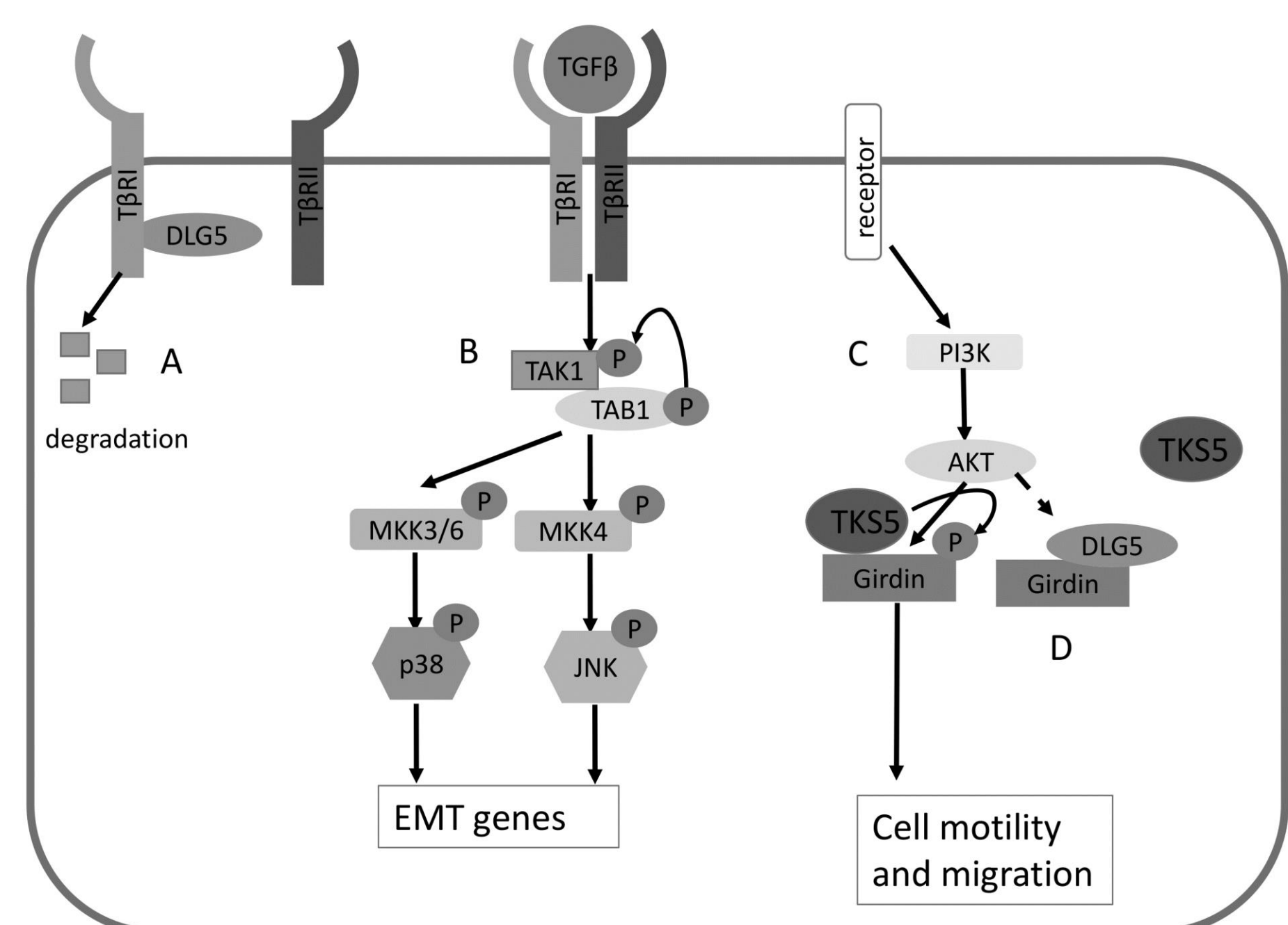


Figure 1: Role of Dlg5 and TGF- $\beta$  in cancer prevention (extracted from [1]).

### SEEK

Shared Explainable Embeddings for Knowledge graphs



The SEEK explanations highlight their co-location in the basolateral plasma membrane and their participation in the MAPK cascade.

#### SEEK explanation

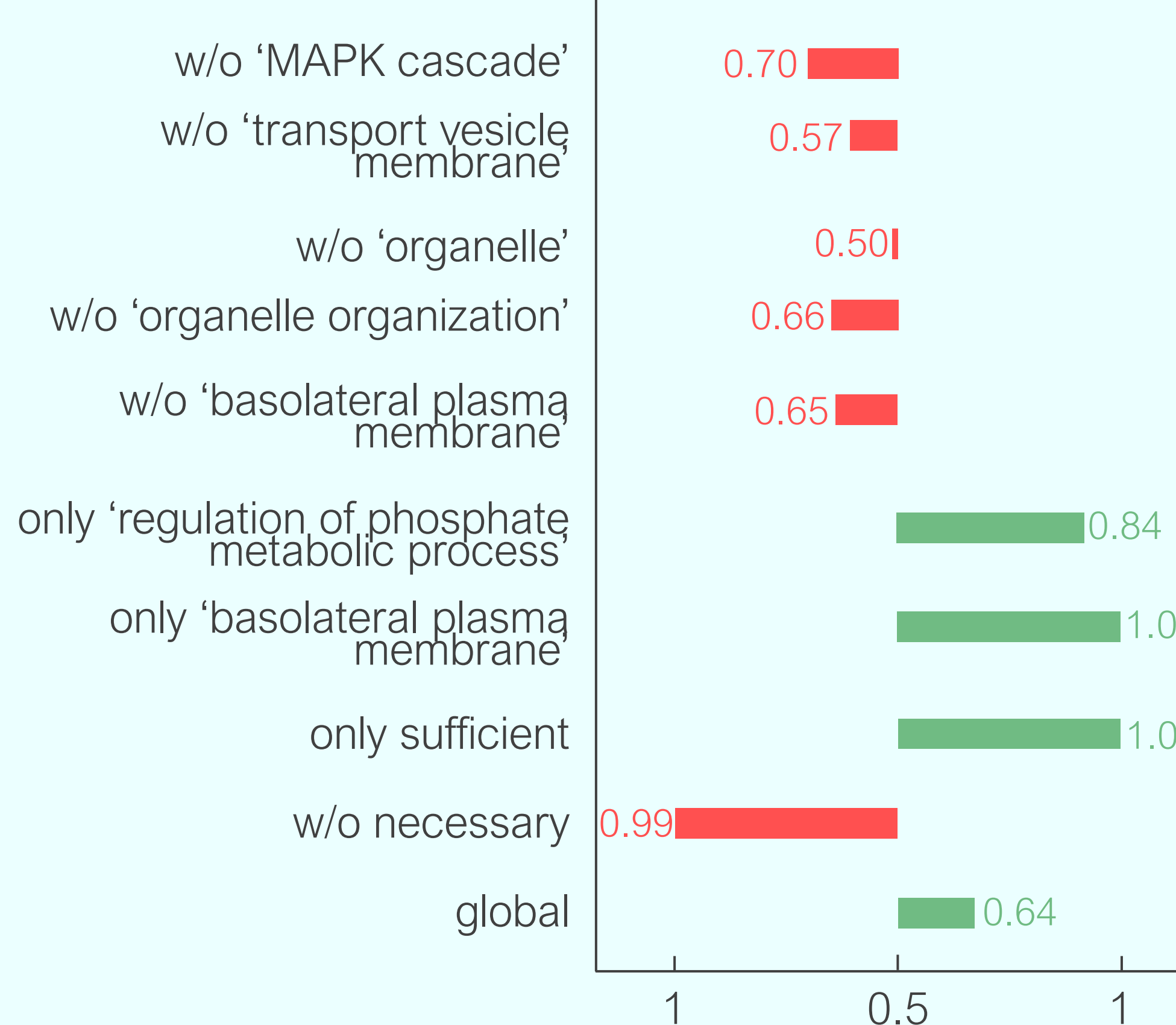
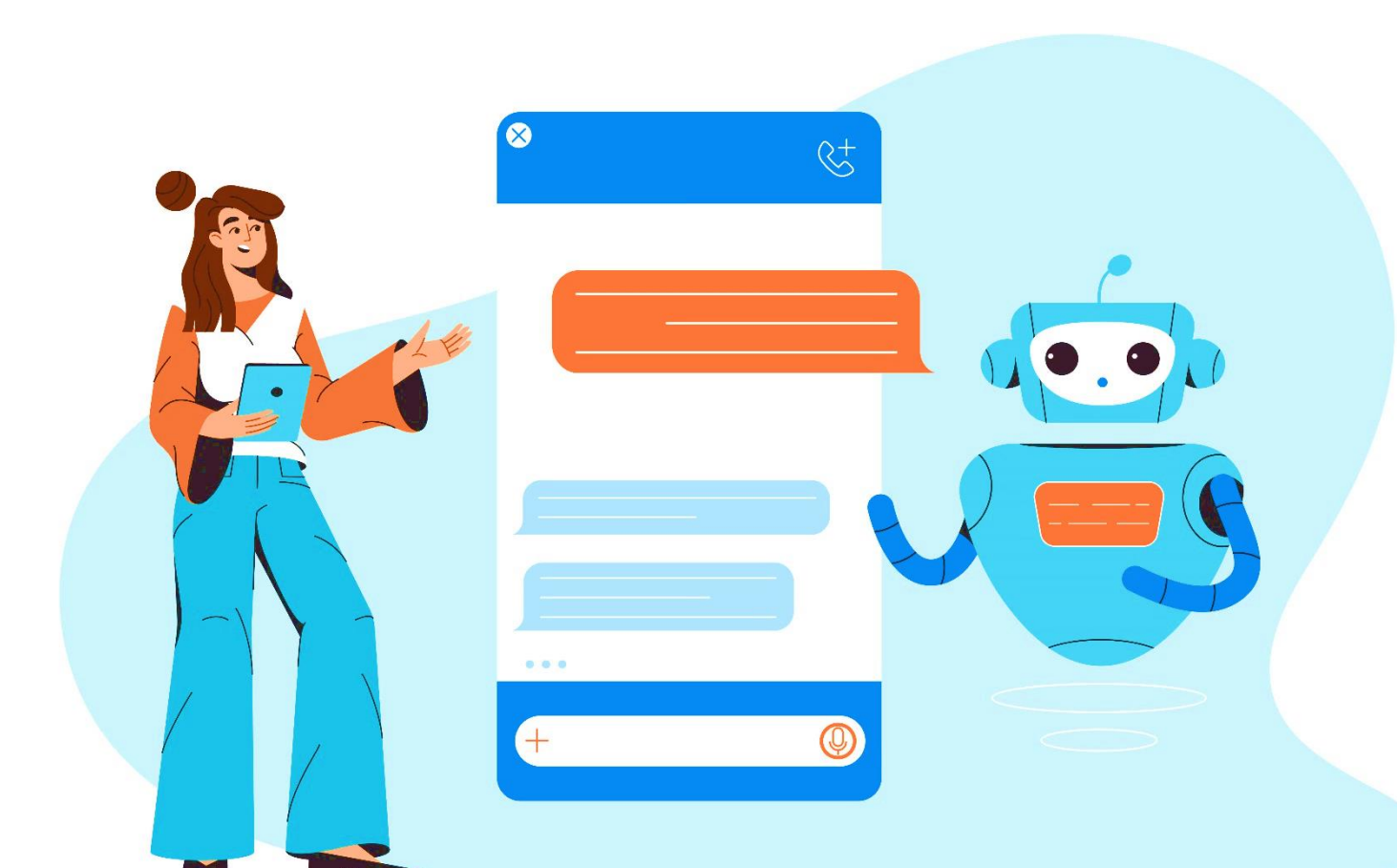


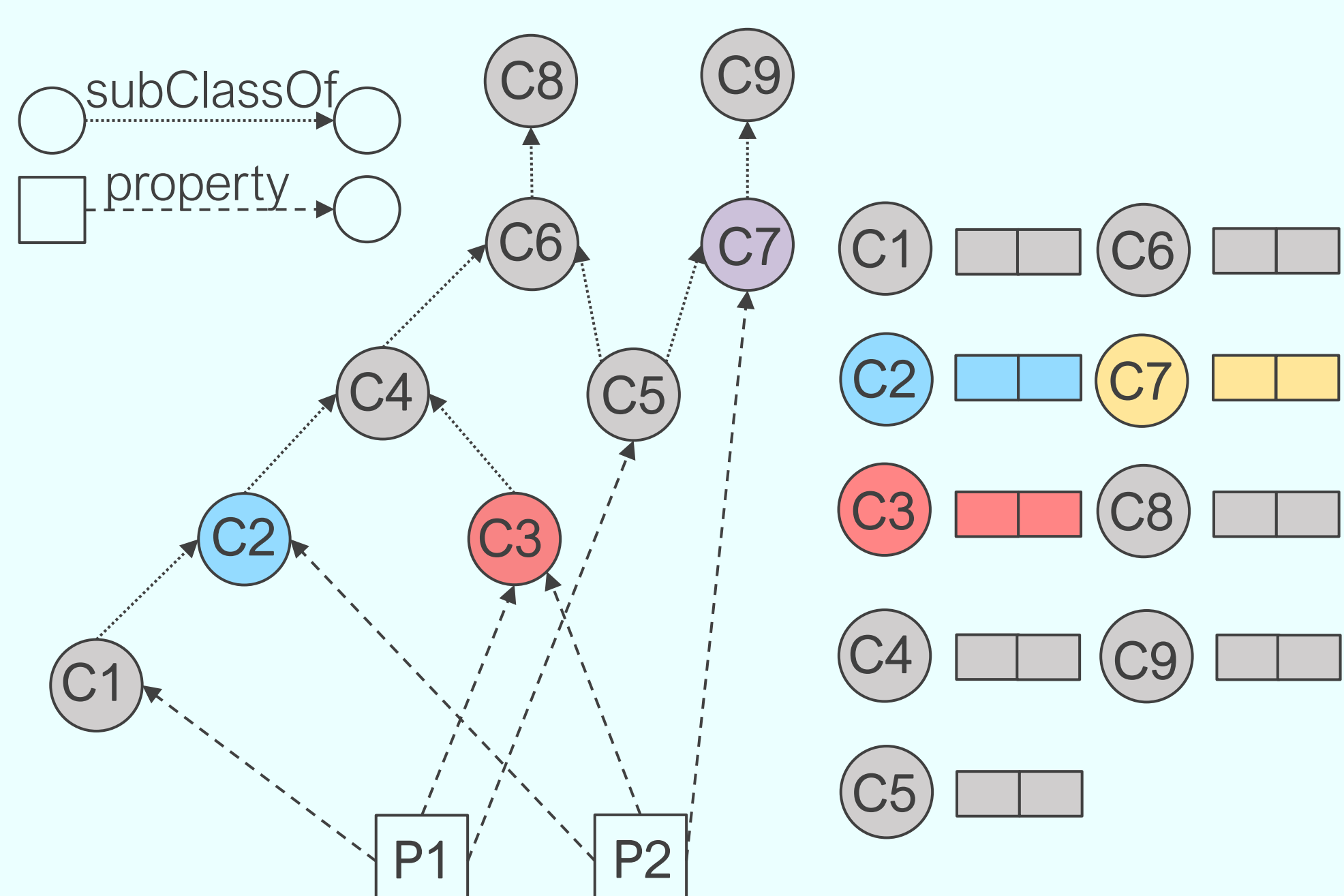
Figure 2: Bar chart using different sets of disjoint common ancestors to represent the pair. Each bar represents the likelihood returned by the ML model of the predicted class being correct (red for class 0 and green for class 1).

### ChatGPT

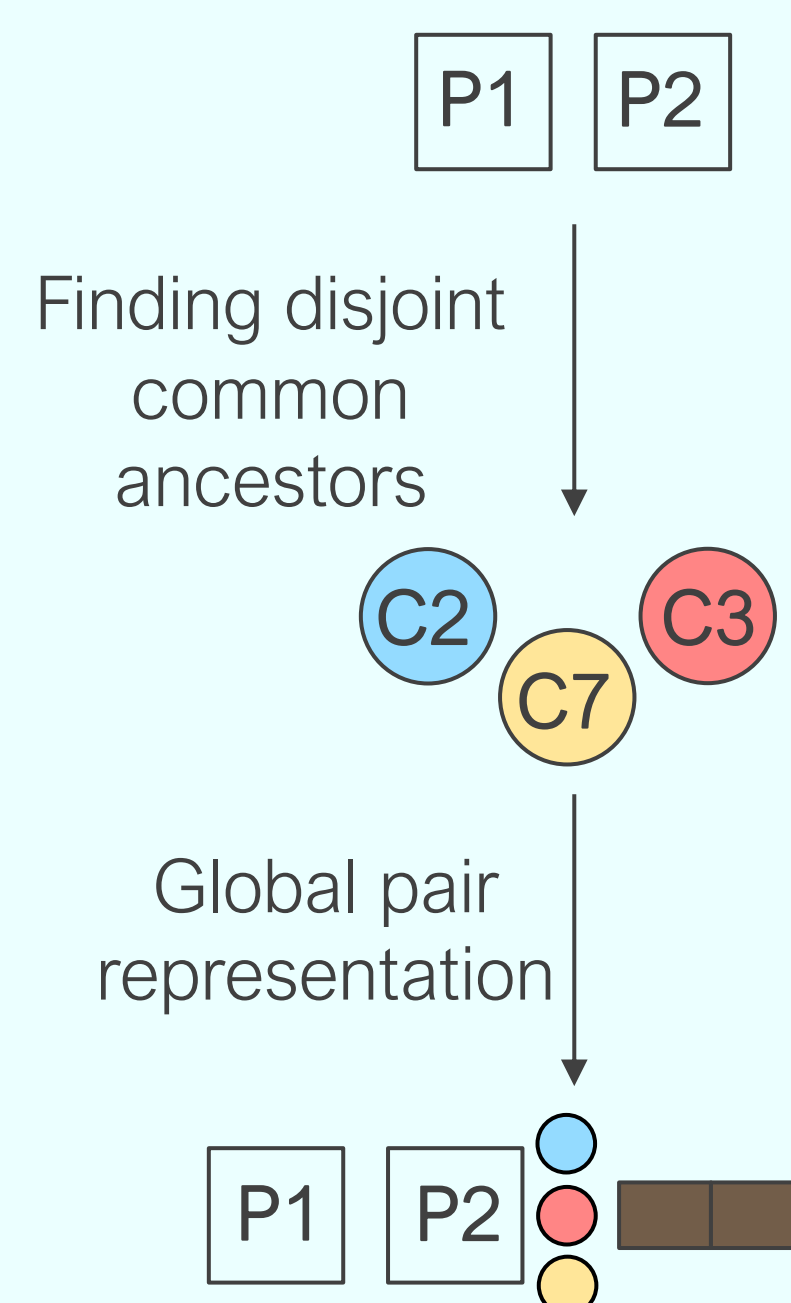


- R** Do TGF- $\alpha$  and DLG2 interact?
- G** There is currently no evidence to suggest a direct interaction between TGF- $\alpha$  and DLG2. While TGF- $\alpha$  and DLG2 may be involved in similar cellular processes, there is no known physical interaction between them.
- R** Can you explain why TGF- $\alpha$  and DLG2 interact?
- G** TGF- $\alpha$  and DLG2 are two proteins that have been found to interact in various cellular contexts. Additionally, studies have suggested that the interaction between TGF- $\alpha$  and Dlg2 may play a role in cancer development and progression.
- R** Can you explain why TGF- $\alpha$  and DLG2 do not interact?
- G** As an AI language model, I don't have access to the latest research developments and cannot give a definitive answer to this specific question without more information on the context of the interaction you are referring to.

#### (i) Generating the RDF graph and learning embeddings



#### (ii) Finding shared semantic aspects and generating pair representations



#### (iii) Predicting and Explaining

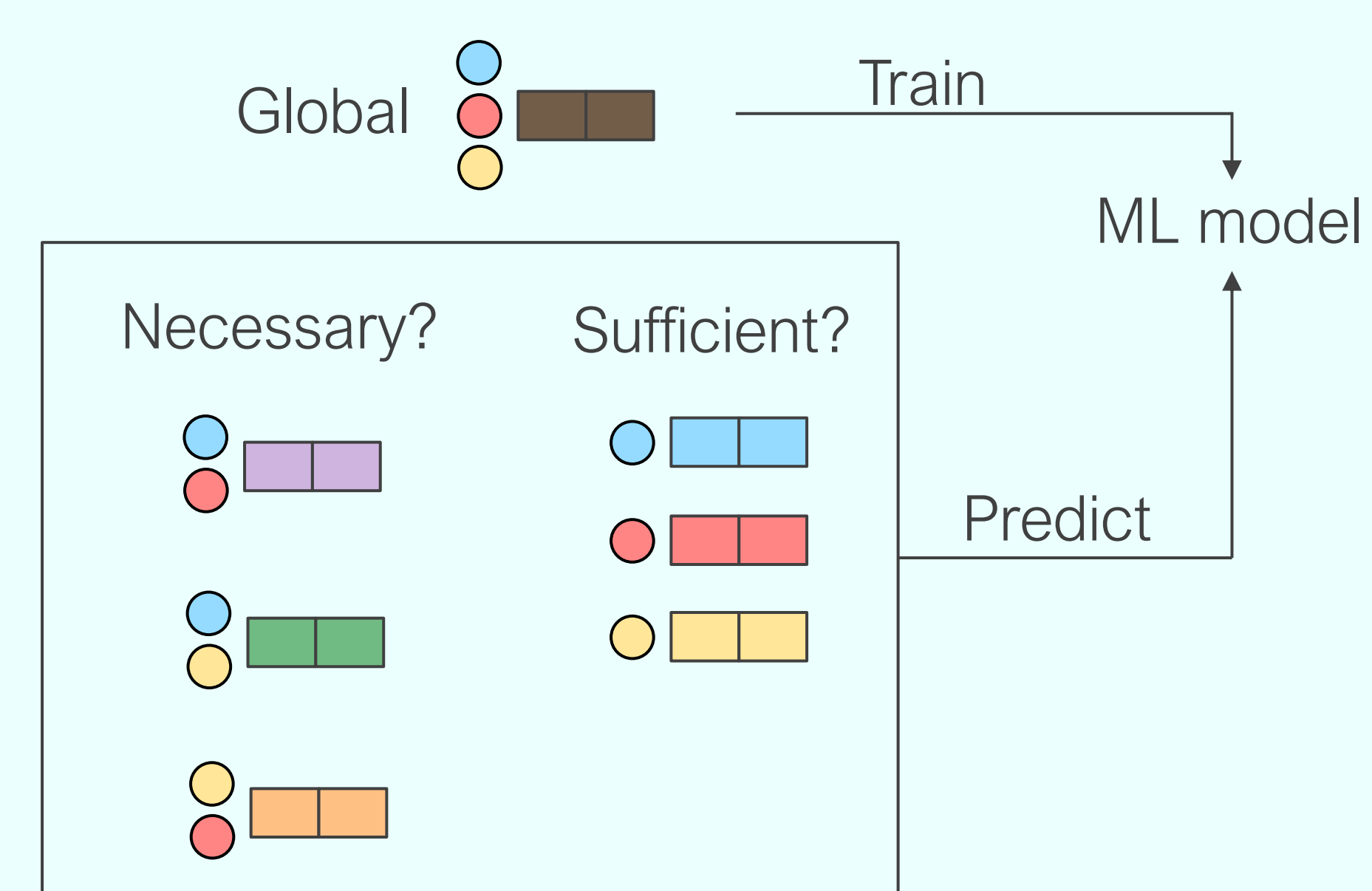


Figure 3: Overview of SEEK.