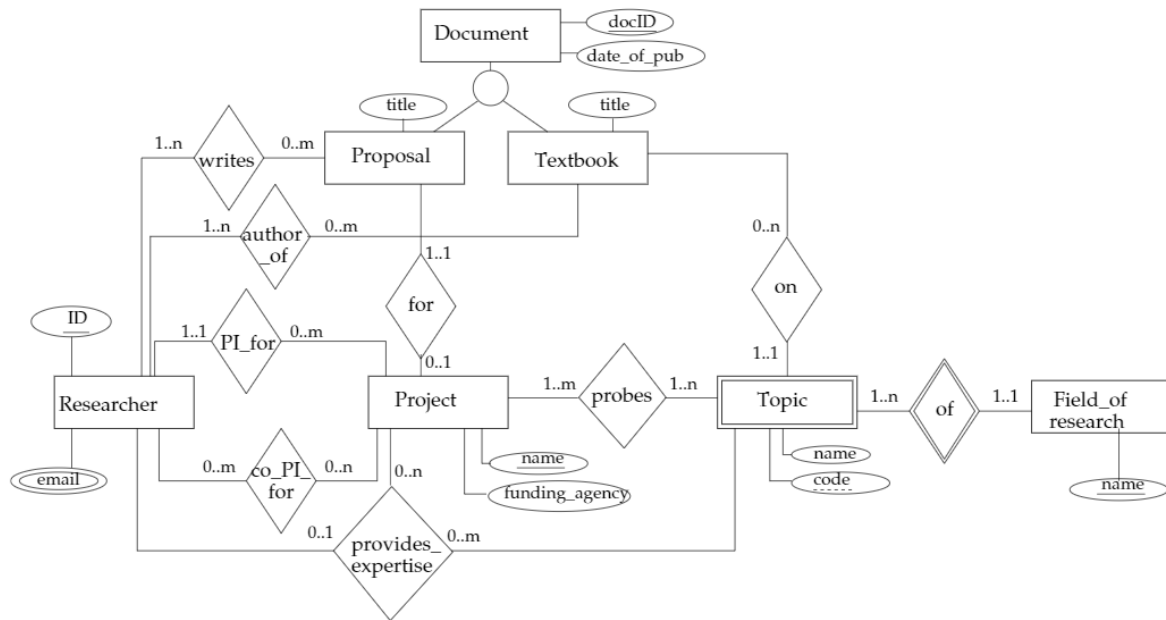Julian Garcia
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**I hereby verify that all the work done below is entirely my own work.**

Home Work #6



1. Convert the above ER schema into a compact relational schema making every effort to eliminate the need for null values.

   To help the grader, use the following sequence of possible relations names. Delete the ones that are not needed. For the rest, insert attribute names (underlining primary keys) and indicate foreign keys through statements of the form "*R1.fk_att* refers to *R2.pk_att*"; use identical attribute names for foreign keys wherever possible provided it does not create confusion.

   Add any other relation names you may need at the bottom of the list. Add other integrity constraints (e.g., inclusion dependencies) if applicable.


   **Researcher(ID)**

   **Email(R_ID, Email)**
   **FK: R_ID refers to Researcher.ID**

   **Project(P_name, funding_agency, prop_ID)**
   **FK: prop_ID refers to Proposal.prop_ID**

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**Document (docID, date_of_pub)**

**Proposal (prop_ID, prop_Title)**
**FK: prop_ID refers to Document.docID**

**Textbook (text_ID, text_Title, t_code, F_name)**
**FK: text_ID refers to Document.docID**
**FK: t_code refers to Topic.code**
**FK: F_name refers to Topic.F_name**

**Field of Research (F_name)**
**Topic (F_name, code, topic_name)**
**FK: F_name refers to Field_of_research.F_name**
**Incl. Dep.: Field_of_research.F_name < Topic.topic_name**

**PI_for (P_name)**
**FK: P_name refers to Project.P_name**

**co_PI_for (P_name, R_ID)**
**FK: P_name refers to Project.P_name**
**FK: R_ID refers to Researcher.ID**

**Author_of (R_ID, text_ID)**
**FK: text_ID refers to Textbook.text_ID**
**FK: R_ID refers to Researcher.ID**
**Incl. Dep.: Textbook.text_Id < Author_of.text_ID**

**Writes (R_ID, prop_ID)**
**FK: prop_ID refers to Proposal.prop_ID**
**FK: R_ID refers to Researcher.ID**
**Incl. Dep.: Proposal.prop_Id < Author_of.prop_ID**

**Expertise_On(R_ID, P_name)**
**FK: P_name refers to Project.P_name**
**FK: R_ID refers to Researcher.ID**

**Expert_Of(R_ID, t_code, f_name)**
**FK: t_code refers to Topic.code**
**FK: F_name refers to Topic.F_name**
**FK: R_ID refers to Researcher.ID**

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**Project_Probes (<u>P_name, t_code, f_name</u>)**
**FK: t_code refers to Topic.code**
**FK: F_name refers to Topic.F_name**
**FK: P_name refers to Project.P_name**
**Incl. Dep.: project.P_name < Project_Probes.P_name**
**Topic._code < Project_Probes.t_code**
**Topic.f_name < Project_Probes.f_name**

<span style="color:red">**DELETED/UNNECESSARY RELATIONS:**</span>

<span style="color:red">**Proposal_For ()**</span>
<span style="color:red">**Textbook_On ()**</span>
<span style="color:red">**Topic_Of ()**</span>

<span style="color:red">**//CHOSE TO SPLIT THIS RELATIONSHIP INTO TWO**</span>
<span style="color:red">**Provides_Expertise (R_ID, P_name, t_code, F_name)**</span>
<span style="color:red">**FK: t_code refers to Topic.code**</span>
<span style="color:red">**FK: F_name refers to Topic.F_name**</span>
<span style="color:red">**FK: P_name refers to Project.P_name**</span>
<span style="color:red">**FK: R_ID refers to Researcher.ID**</span>