# Exercises: Advanced Django Model Techniques

This document defines the **exercise assignments** for the [Python ORM course @ Software University](https://softuni.bg/trainings/4253/python-orm-october-2023).

Submit your solutions in the SoftUni [Judge system](https://judge.softuni.org/Contests/4332/Advanced-Django-Model-Techniques-Exercise).

## Customer

Write a Django model called "**Customer"** with the provided information:

* "**name**" - character field, **consisting of a maximum of 100 characters**. The name must contain only **letters** and **spaces**, otherwise raise a "**ValidationError"** with the message: "**Name can only contain letters and spaces"**.
* "**age**" - positive integer field. If the **age** is under 18, **raise** a "**ValidationError"** with the message: "**Age must be greater than 18"**.
* "**email**" - email field. If the email is **invalid**, raise a "**ValidationError"** with the message: "**Enter a valid email address"**.
* "**phone\_number**" - character field, **consisting of a maximum of 13 characters**. The phone number must start with **"+359"** followed by 9 more digits, otherwise raise a "**ValidationError"** with the message: **"Phone number must start with a '+359' followed by 9 digits"**.
* "**website\_url**" - URL field. If the URL is **invalid**, raise a "**ValidationError"** with the message "**Enter a valid URL**".

### Examples

**When submitting your solution to the Judge system, please, refactor the caller.py file as you comment or delete the creation of the objects, otherwise, it will have an impact on the database and the results of the Judge tests.**

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| **Test Code - caller.py** |
| customer = Customer(  name="Svetlin Nakov1",  age=1,  email="nakov@example",  phone\_number="+35912345678",  website\_url="htsatps://nakov.com/" )  try:  customer.full\_clean()  customer.save() except ValidationError as e:  print('\n'.join(e.messages)) |
| **Output** |
| Name can only contain letters and spaces  Age must be greater than 18  Enter a valid email address  Phone number must start with '+359' followed by 9 digits  Enter a valid URL |

## Media

You'll build a media management system that handles various types of media, including books, movies, and music.

Write a Django model called "**BaseMedia"**. It is a base model, **and it is NOT meant to create a database table on its own**. The model has the following fields:

* "**title**" - character field, **consisting of a maximum of 100 characters.**
* "**description**" - text field.
* "**genre**" - character field, **consisting of a maximum of 50 characters.**
* "**created\_at**" - date time field. Every time a **new** **record** is created it should save the **current time** of the creation of the **record**.

Write a **second** Django model called "**Book"**. It is a model of type **media**. The model has the following fields:

* "**author**" - character field, **consisting of a maximum of 100 characters.** The title must have at least 5 characters, otherwise, raise a "**ValidationError"** with the message "**Author must be at least 5 characters long**".
* "**isbn**" - character field, **consisting of a maximum of 20 characters, unique.** The isbn must have at least 6 characters, otherwise, raise a "**ValidationError"** with the message "**ISBN must be at least 6 characters long**".

Write a **third** Django model called "**Movie"**. It is a model of type **media**. The model has the following fields:

* "**director**" - character field, **consisting of a maximum of 100 characters.** The director must have at least 8 characters, otherwise, raise a "**ValidationError"** with the message "**Director must be at least**

**8 characters long**".

Write a **fourth** Django model called "**Music"**. It is a model of type **media**. The model has the following fields:

* "**artist**" - character field, **consisting of a maximum of 100 characters.** The artist must have at least 9 characters, otherwise, raise a "**ValidationError"** with the message "**Artist must be at least 9 characters long**".

### BaseMedia Meta class

* **Order** the fields by "**created\_at**" (**descending**) and "**title**" (**ascending**).

### Book Meta class

* The "**Meta**" class should **inherit** its parent class fields**.** Also, set the **verbose name** to "**Model Book**" and the **plural verbose name** to "**Models of type - Book**".

### Movie Meta class

* The "**Meta**" class should **inherit** its parent class fields**.** Also, set the **verbose name** to "**Model Movie**" and the **plural verbose name** to "**Models of type - Movie**".

### Music Meta class

* The "**Meta**" class should **inherit** its parent class fields**.** Also, set the **verbose name** to "**Model Music**" and the **plural verbose name** to "**Models of type - Music** ".

### Examples

**When submitting your solution to the Judge system, please, refactor the caller.py file as you comment or delete the creation of the objects, otherwise, it will have an impact on the database and the results of the Judge tests.**

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| **Test Code - caller.py** |
| book = Book(  title="Short Title",  description="A book with a short title.",  genre="Fiction",  author="A",  isbn="1234" )  try:  book.full\_clean()  book.save()  except ValidationError as e:  print("Validation Error for Book:")  for field, errors in e.message\_dict.items():  print(f"{field}: {', '.join(errors)}") |
| **Output** |
| Validation Error for Book:  author: Author must be at least 5 characters long  isbn: ISBN must be at least 6 characters long |

## Digital Products

Write a Django model called "**Product"**. The model has the following fields:

* "**name**" - character field, **consisting of a maximum of 100 characters.**
* "**price**" - decimal field, **with maximum of 10 digits and 2 decimal places.**

Write a **second** Django model called " **DiscountedProduct"**. It is a **type** of **product**.

### DiscountedProduct Meta class

* The model "**DiscountedProduct**" shares the same **database** **table** as its parent model "**Product**" and provides **additional** or **customized** functionality.

### Methods inside the Product model

Method: "**calculate\_tax()**" **returns** the **tax** for the product. The **tax rate** is **8%** of the **price**.

Method: "**calculate\_shipping\_cost(weight: Decimal)**" **returns** the calculated **shipping cost** for the product. The **shipping cost** is the **weight units** of the product **multiplied** by **2.00**.

Method: "**format\_product\_name()**" **returns** the **name** of the product in the **format**:

* **"Product: {product\_name}"**

### Methods inside the DiscountedProduct model

Method: "**calculate\_price\_without\_discount()**" **returns** the calculated **price without discount** for the product. The **original** **price** is **20%** higher than the **price** **without** a **discount**.

Method: "**calculate\_tax()**" **returns** the **tax** for the product. The **tax rate** is **5%** of the **price**.

Method: "**calculate\_shipping\_cost(weight: Decimal)**" **returns** the calculated **shipping cost** for the product. The **shipping cost** is the **weight units** of the product **multiplied** by **1.50**.

Method: "**format\_product\_name()**" **returns** the **name** of the product in the **format**:

* **"Discounted Product: {product\_name}"**

### Examples

**When submitting your solution to the Judge system, please, refactor the caller.py file as you comment or delete the creation of the objects, otherwise, it will have an impact on the database and the results of the Judge tests.**

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| **Test Code - caller.py** |
| # Create a Product instance product = Product.objects.create(name="Gaming Keyboard", price=Decimal(100.00))  # Calculate and print the tax tax\_price = product.calculate\_tax() print(f"Tax for {product.name}: ${tax\_price:.2f}")  # Calculate and print the shipping cost shipping\_cost = product.calculate\_shipping\_cost(Decimal(2.50)) print(f"Shipping Cost for {product.name}: ${shipping\_cost:.2f}")  # Format and print the product name formatted\_name = product.format\_product\_name() print(f"Formatted Product Name: {formatted\_name}")  # Create a DiscountedProduct instance discounted\_product = DiscountedProduct.objects.create(name="Gaming Mouse", price=Decimal(120.00))  # Calculate and print the price without discount (DiscountedProduct) discounted\_price = discounted\_product.calculate\_price\_without\_discount() print(f"Price Without Discount for {discounted\_product.name}: ${discounted\_price:.2f}")  # Calculate and print the tax (DiscountedProduct) tax\_price = discounted\_product.calculate\_tax() print(f"Tax for {discounted\_product.name}: ${tax\_price:.2f}")  # Calculate and print the shipping cost (DiscountedProduct) shipping\_cost = discounted\_product.calculate\_shipping\_cost(Decimal(2.50)) print(f"Shipping Cost for {discounted\_product.name}: ${shipping\_cost:.2f}")  # Format and print the product name (DiscountedProduct) formatted\_name = discounted\_product.format\_product\_name() print(f"Formatted Product Name: {formatted\_name}") |
| **Output** |
| Tax for Gaming Keyboard: $8.00  Shipping Cost for Gaming Keyboard: $5.00  Formatted Product Name: Product: Gaming Keyboard  Price Without Discount for Gaming Mouse: $144.00  Tax for Gaming Mouse: $6.00  Shipping Cost for Gaming Mouse: $3.75  Formatted Product Name: Discounted Product: Gaming Mouse |

## Superhero Universe

Write a Django model called "**Hero"**. The model has the following fields:

* "**name**" - character field, **consisting of a maximum of 100 characters.**
* "**hero\_title**" - character field, **consisting of a maximum of 100 characters.**
* "**energy**" - positive integer field.

Write a **second** Django model called "**SpiderHero"**. It is a **type** of **hero**.

Write a **third** Django model called "**FlashHero"**. It is a **type** of **hero**.

### Methods inside the SpiderHero model

Method: **"swing\_from\_buildings()"** is the secret special ability of the **spider** **hero**. Each time the **ability** is used, the hero's **energy** **decreases** with **80** units.

* If the **energy is less than or equal to 0,** only **return** as a result: **"{hero\_name} as Spider Hero is out of web shooter fluid"**.
* If you **successfully** used the ability (the **remaining** **energy** is a **positive number**), **save** all the changes, and **return** as a result: **"{hero\_name} as Spider Hero swings from buildings using web shooters"**.

### Methods inside the FlashHero model

Method: **"run\_at\_super\_speed()"** is the secret special ability of the **flash** **hero**. Each time the **ability** is used, the hero's **energy** **decreases** with **65** units.

* If the **energy is less than or equal to 0,** only **return** as a result: **"{hero\_name} as Flash Hero needs to recharge the speed force"**.
* If you **successfully** used the ability (the **remaining** **energy** is a **positive number**), **save** all the changes, and **return** as a result: **"{hero\_name} as Flash Hero runs at lightning speed, saving the day"**.

### SpiderHero Meta class

* The model "**SpiderHero**" shares the same **database** **table** as its parent model "**Hero**" and provides **additional** or **customized** functionality.

### FlashHero Meta class

* The model "**FlashHero**" shares the same **database** **table** as its parent model "**Hero**" and provides **additional** or **customized** functionality.

### Mixin RechargeEnergyMixin

Write a **mixin** called "**RechargeEnergyMixin**". The **mixin** has the following method:

Method: **"recharge\_energy(amount: int)"** **recharges** the **energy** for the hero with the given **amount**. The energy **cannot** exceed **100**.

**Note**: **Inherit** the **mixin** in the "**Hero**" model.

### Examples

**When submitting your solution to the Judge system, please, refactor the caller.py file as you comment or delete the creation of the objects, otherwise, it will have an impact on the database and the results of the Judge tests.**

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| **Test Code - caller.py** |
| *# Create instance of SpiderHero* spiderman = SpiderHero(name="Spider-Man", hero\_title="Spider Hero", energy=100) *# Create instance of FlashHero* flash = FlashHero(name="The Flash", hero\_title="Flash Hero", energy=70)  *# Save the instances to the database* spiderman.save() flash.save()  *# Run the special abilities* print(spiderman.swing\_from\_buildings()) print(flash.run\_at\_super\_speed()) print(spiderman.swing\_from\_buildings())  *# Recharge the energy of Spider-Man and The Flash using the mixin method* spiderman.recharge\_energy(195) flash.recharge\_energy(40)  *# Now you can check the updated energy levels* print(f"{spiderman.name} - Energy: {spiderman.energy}") print(f"{flash.name} - Energy: {flash.energy}") |
| **Output** |
| Spider-Man as Spider Hero swings from buildings using web shooters  The Flash as Flash Hero runs at lightning speed, saving the day  Spider-Man as Spider Hero is out of web shooter fluid  Spider-Man - Energy: 100  The Flash - Energy: 45 |

## \*Vector Searching

In this **exercise**, you will create a Django **model** called "**Document**" for storing **documents** with the ability to perform **efficient** **full-text searches**. The model has the following fields:

* "**title**" - character field, **consisting of a maximum of 200 characters.**
* "**content**" - text field.
* "**search\_vector**" - "**SearchVectorField"**, with **null="True"**.

### Document Meta class

* The model "**Document**" has an **indexes** option. The only **field** in the option is "**search\_vector**".

Read more about the "**SearchVectorField"** at:

* <https://docs.djangoproject.com/en/4.2/ref/contrib/postgres/search/#searchvectorfield>

**This exercise is not amenable to evaluation through the Judge system.**

### Examples

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| **Test Code - caller.py** |
| from django.contrib.postgres.search import SearchVector  # Create the first 'Document' object with a title and content. document1 = Document.objects.create(  title="Django Framework 1",  content="Django is a high-level Python web framework for building web applications.", )  # Create the second 'Document' object with a title and content. document2 = Document.objects.create(  title="Django Framework 2",  content="Django framework provides tools for creating web pages, handling URL routing, and more.", )  # Update the 'search\_vector' field in the 'Document' model with search vectors. Document.objects.update(search\_vector=SearchVector('title', 'content'))  # Perform a full-text search for documents containing the words 'django' and 'web framework'. results = Document.objects.filter(search\_vector='django web framework')  # Print the search results. for result in results:  print(f"Title: {result.title}") |
| **Output** |
| Title: Django Framework 1  Title: Django Framework 2 |

### Hint

The "**SearchVectorField"** in Django is a specialized field used in combination with **PostgreSQL's** full-text search capabilities. It allows you to efficiently perform **full-text searches** on the textual content of your **model** instances.

When data is saved to a "**SearchVectorField"**, the text content is preprocessed, which typically includes

* **Tokenization**: Breaking text into words or tokens.
* **Stemming**: Reducing words to their root form (e.g., "running" becomes "run").
* **Lowercasing**: Converting all text to lowercase for case-insensitive searches.
* **Removing stopwords**: Eliminating common words like "and," "the," "is," etc.
* Other text transformations.



The "**SearchVectorField"** field comes from Django's **PostgreSQL**-specific extension for advanced text search features. This extension, part of the "**django.contrib.postgres"** module, extends Django's capabilities to work seamlessly with **PostgreSQL's** advanced text search functionality.

Картина, която съдържа текст, екранна снимка, Шрифт

Описанието е генерирано автоматично