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Cars Trading Website

~ Bachelor's Thesis Presentation ~

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PRESENTATION CONTENT

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 - ❖ Recommender System
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INTRODUCTION

- ❖ The project is an online website that is allowing users to trade cars, motorcycles and car parts more efficient, by connecting buyers and sellers on a platform.
- ❖ The sellers can post announcements with second hand cars, or new ones as a dealership, and will provide many details about the car like: Make, model, price, year, mileage, body type, fuel type, images, option package etc.
- ❖ A fresh announcement will not be displayed immediately, it will need admin or moderator approval.
- ❖ The announcement will contain also seller contact information, the main contact method is through the integrated chat system

INTRODUCTION

- ❖ There is the possibility for the users to get recommended announcements
- ❖ The main roles of the application are:
 - ❖ Application User (Buyer/Seller)
 - ❖ Admin
 - ❖ Moderator
- ❖ The admin is managing the users activity and can take actions against users that are disobeying platform rules and guidelines
- ❖ The name of the website is Racooter, formed from two words “*Racoon*” and “*Scooter*”, so the motto of the platform is “*How do you call a racoon on a scooter? - Racooter*”.



Figure 1. App logo

TECHNOLOGIES AND FRAMEWORKS

- ❖ The project is created using ASP.NET Core 3.1
- ❖ The backend language is C#
- ❖ The frontend frameworks used are: HTML, CSS, JavaScript, Bootstrap, RazorPages (.CSHTML)
- ❖ The IDE used is Visual Studio 2019
- ❖ To host the database I used SQL Server
- ❖ For version control I used GitHub

ARCHITECTURE AND DESIGN PATTERNS

- ❖ The project architecture consists in three main layers:
 - ❖ **Data Access** - is abstracting the database to have more flexibility over accessing and storing data efficiently, not impacting the business logic of the application.
 - ❖ **Business Logic** - is a bridge between Data access layer and Presentation layer, containing the main backend logic of the app
 - ❖ **Presentation layer** – displays information sent from other layers in the user interface

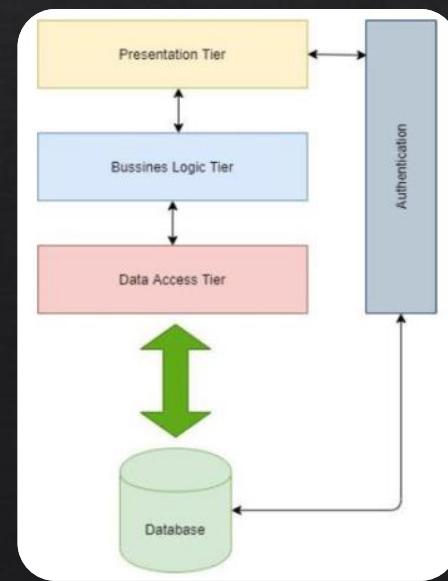


Figure 2. Layers relationship

ARCHITECTURE AND DESIGN PATTERNS

- ❖ Patterns used in the project are:
 - ❖ **MVC** (Model, View, Controller)
 - ❖ **Model:** is the dynamic data structure, independent from the UI, it manages the data and logic of the app
 - ❖ **View:** main responsibility is to display the content in the UI, is using the Razor view engine to integrate C# code in HTML, the logic in the view should be minimal
 - ❖ **Controller:** accepts input and converts it to commands for the model or view

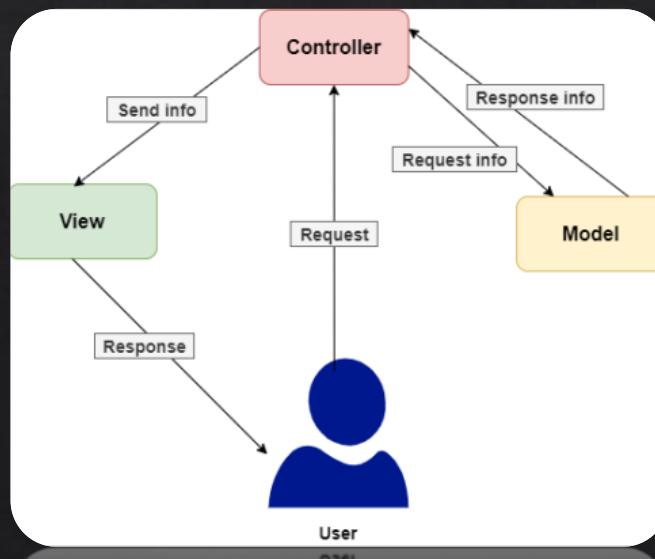


Figure 3. MVC pattern scheme

ARCHITECTURE AND DESIGN PATTERNS

- ❖ **Repository pattern** – is a technique for abstracting data access, that is responsible with storing and retrieving data
- ❖ Repositories are classes that encapsulates the logic needed to access data sources, offering a good maintenance because is independent from the infrastructure that used to access the database from the model layer.
- ❖ A repository is allowing the population of data in memory that is retrieved from the database using entities, then in memory they can be changed according to the use and purpose of them, after are persisted back to the database using transactions

FUNCTIONALITIES BASED ON USE CASE DIAGRAMS

- ❖ A use case diagram can illustrate in a more visual and practical way the functionalities and requirements of the application.
- ❖ The diagram indicates all the actions and features an Application user, Guest, Admin and Moderator can do with the use of this application
- ❖ It will be shown the use case diagrams for:
 - ❖ Application user (Buyer/Seller) and Guest
 - ❖ Admin and Moderator

FUNCTIONALITIES BASED ON USE CASE DIAGRAMS

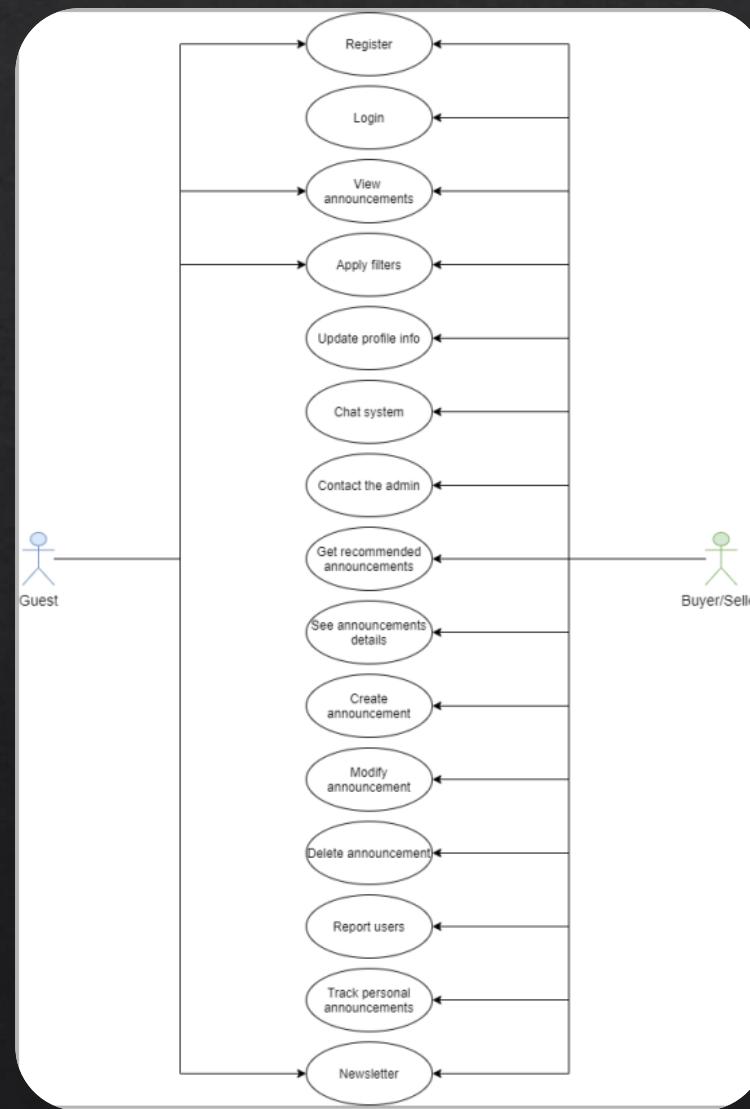


Figure 4. Use case diagram for Buyer/Seller and Guest

FUNCTIONALITIES BASED ON USE CASE DIAGRAMS

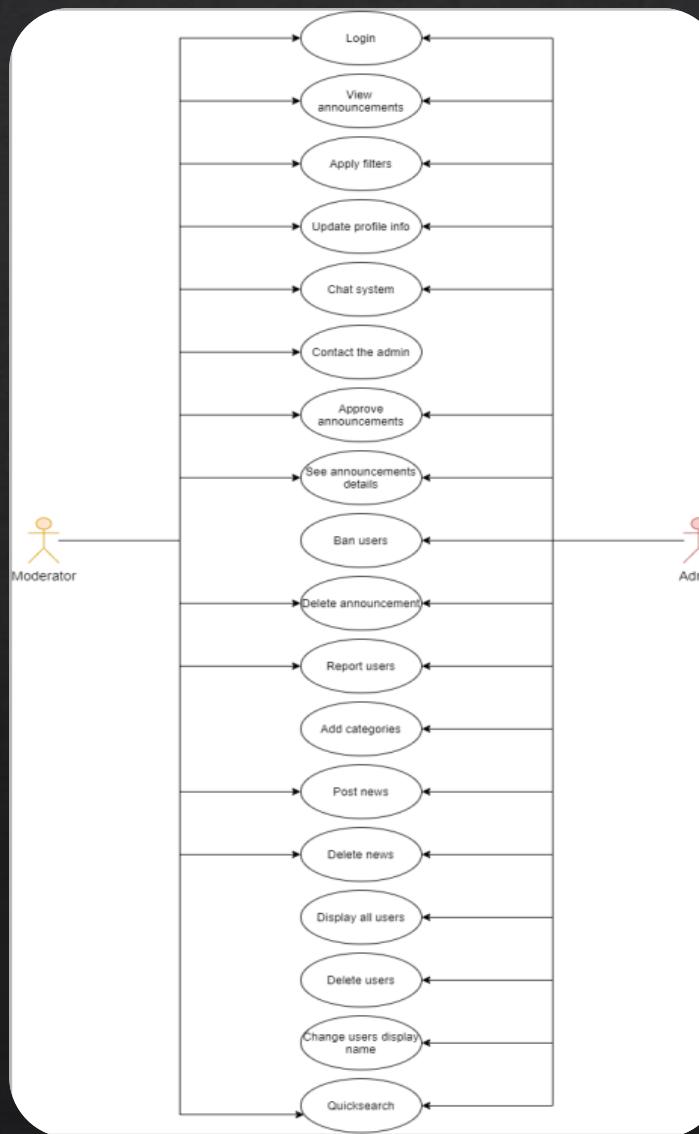


Figure 5. Use case diagram for Admin and Moderator

ENTITY RELATIONSHIP DIAGRAM

- ◆ Below can be seen the ERD for my application, in this way it is observed the database structure:

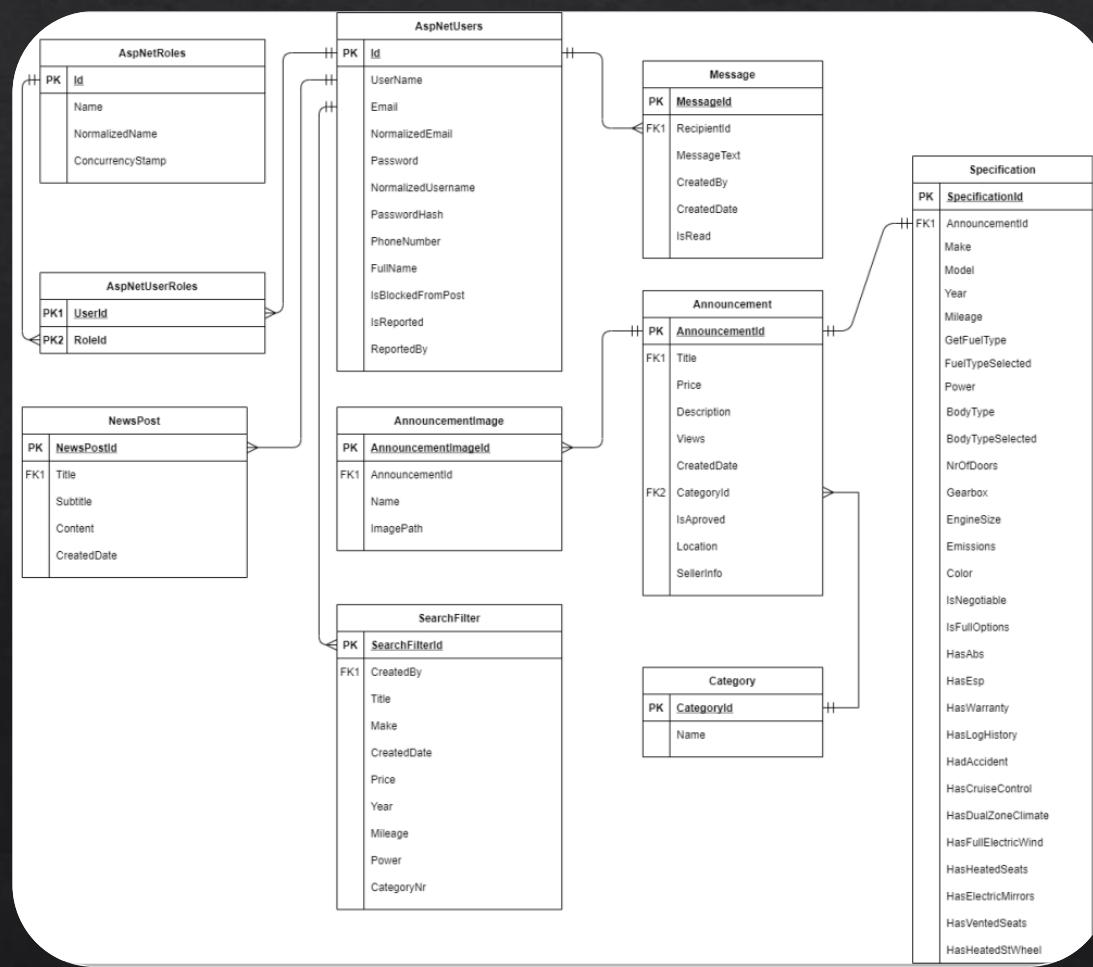


Figure 6. Entity Relationship Diagram

PROJECT STRUCTURE AND FLOW

- ❖ Taking in consideration the three layered architecture, the Repository pattern and MVC design, I structured the project in three modules and another one that represents presentation tier with views and controllers:
 - ❖ **Racooter.BusinessLogic** – will contain the application logic.
 - ❖ **Racooter.DataAccess** – will contain files and folders related to accessing the database and its abstraction process using the repositories and models.
 - ❖ **Racooter.DataTransferObjects** – DTO are used to transport data between the processes, transforming the usual multiple calls in a single one storing essential info that needs to be passed to the next layer.
 - ❖ **RacooterCarTradingApp** – this is the main application that is implementing the views, controllers and setup options for the project

PROJECT STRUCTURE AND FLOW

- ❖ Below is a screenshot from Visual Studio 2019 with the project structure:

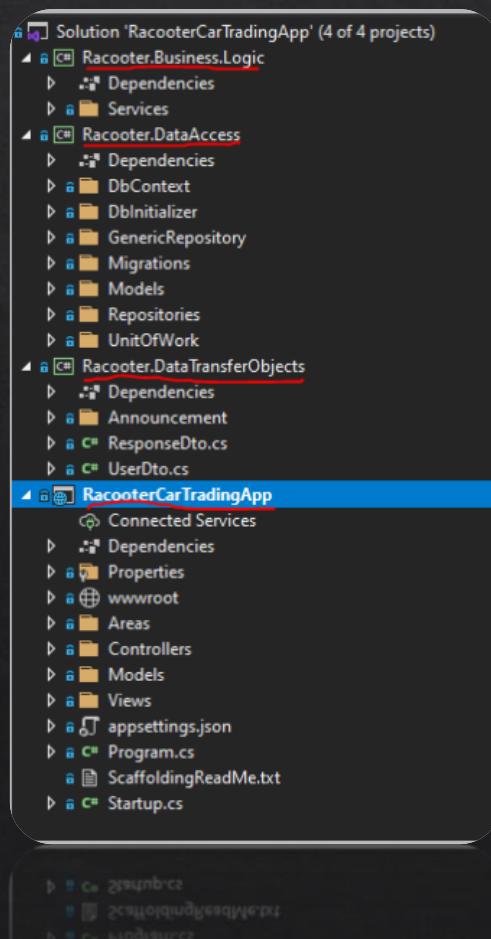


Figure 7. Project structure

PROJECT STRUCTURE AND FLOW

- ❖ A main flow of the application will be presented in the following schema, as an example is taken the action to ADD announcement. The schema will describe visually all the layers, processes and files containing methods that will complete the request of adding an announcement:

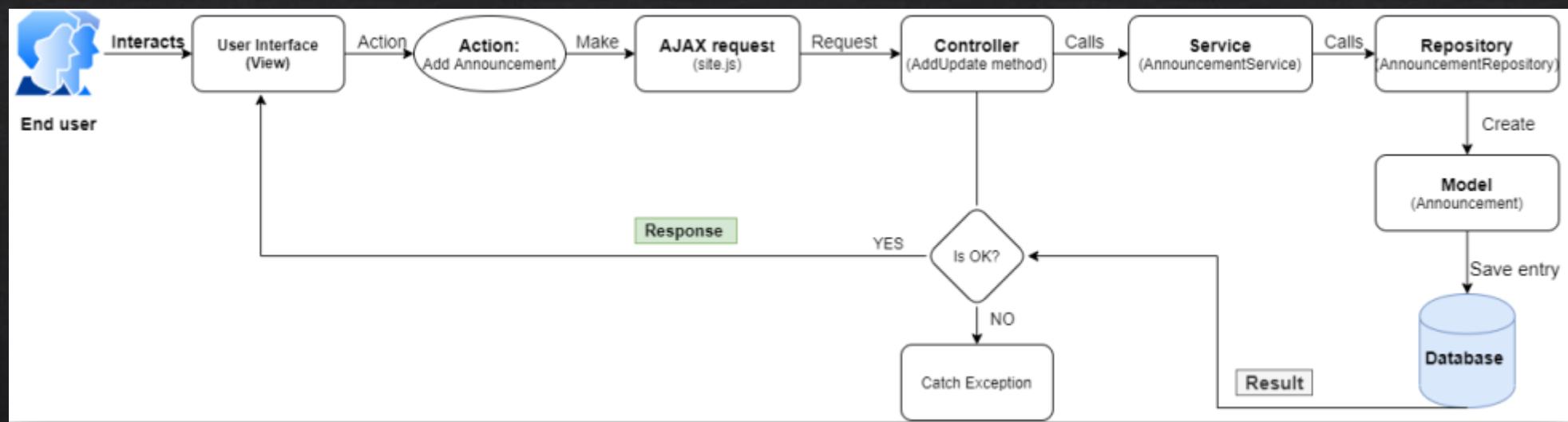


Figure 8. Features implementation flow

MAIN FEATURES

~ Create and Update announcement ~

- ❖ This feature represents the adding a new announcement by completing all the required fields in the adding form.
- ❖ For the updating an announcement is used the same method *AddUpdate* that is adapted to have this dual functionality
- ❖ The mandatory fields are Title, Category, Price, Location, Description, Make, Model, Year, Mileage, and adding pictures.
- ❖ On the next slide will be shown the adding form interface

MAIN FEATURES

~ Create and Update announcement ~

The screenshot shows a web-based form for creating or updating a car advertisement. The form is divided into several sections:

- General Information:** Fields include Title (Hyundai), Category (auto), Price (EUR) (5000), Date (30-Aug-2021), Location (Craiova, Romania), and Is Negotiable (Yes). Description is set to "Hyundai Santa Fe 2.0 112 Hp euro 4".
- Specifications:** A large section containing various car details:
 - Make (Hyundai), Model (Santa Fe)
 - Year (2002), Mileage (200000)
 - Power (HP) (112), Body Type (SUV)
 - Number Of Doors (5), Engine Size (2000)
 - Emissions (2000), Color (silver)
 - Fuel Type (Diesel)
- Options:** A grid of checkboxes for various features:

Has ABS	Has ESP
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>
- Image Upload:** Buttons for "Choose File" (Hyundai-Santa-Fe-II.jpg) and "Choose File" (2007-2009,...-2011.jpg).
- Buttons:** "Add Image", "Save", and "Cancel".

Figure 9. Add-Update form

MAIN FEATURES

~ Create and Update announcement ~

Announcements

Astra G Price: 2000.00 € Date: 13-Aug-21 4:09:23 PM Seller: Ion Dinu Category: auto ② 17 Contact Seller	Catalizator Golf 4 Price: 300.00 € Date: 13-Aug-21 4:57:37 PM Seller: Test Seller Category: Car parts ② 3 Contact Seller	VW Golf 6 1.6 Diesel Price: 3500.00 € Date: 13-Aug-21 5:44:00 PM Seller: Test Seller Category: auto ② 4 Contact Seller	Golf 4 Price: 1000.00 € Date: 13-Aug-21 5:53:57 PM Seller: Test Seller Category: auto ② 7 Contact Seller
Vand Opel Price: 1150.00 € Date: 13-Aug-21 6:30:22 PM Seller: Test Seller Category: auto ② 3 Contact Seller	Audi A6 Price: 8000.00 € Date: 14-Aug-21 12:28:42 AM Seller: Test Seller Category: auto ② 4 Contact Seller	Vand Motor Price: 2700.00 € Date: 16-Aug-21 11:44:01 PM Seller: Test Seller Category: moto ② 4 Contact Seller	Vand Peugeot Price: 1500.00 € Date: 16-Aug-21 11:50:26 PM Seller: Test Seller Category: auto ② 1 Contact Seller



Figure 10. Announcements display

Vand Opel

Price: **1150.00 €** Category: **auto**
Fixed

Description: The Astra G model is a car manufactured by Opel, sold new from year 1998 until 2000, and available after that as a used car.

Make:	Opel	Model:	Astra G	Year:	2001
Mileage:	280000	Power:	101 HP	BodyType:	Hatchback
Nof of Doors:	5	Engine Size:	1599		
Emissions:	2000	Color:	silver	Is Negotiable:	No
Is Full Options:	No	Has ABS:	Yes	Has ESP:	Yes
Has Warranty:	No	Has Log History:	No	Has Cruise Control:	No
Has Dual Zone Climate:	No	Has Full Electric Win:	No	Has Heated Seats:	No
Has Vented Seats:	No	Has Electric Mirrors:	No	Has Heated St Wheel:	No
Had Accident:	No	Fuel Type:	Petrol		

② Views: 3

Seller Contact

Name: Test Seller
Email: seller@admin.com
Phone: 0771636098
Location: Craiova, Romania
Posted: 13-Aug-21 6:30:22 PM
[Report Seller](#) [Contact Seller](#)

Figure 11. Announcements details

MAIN FEATURES

~ Review announcements ~

- ❖ The announcements are not displayed immediately after were created, it should wait for the admin or moderator approval.
- ❖ Initially the announcement status in the announcement panel is set to “*Pending Approval*” and after was approved the status will change in “*Approved*” and the announcement will be displayed on the homepage
- ❖ Below will be displayed the announcement panel where can be seen info about the created announcements on a user

MAIN FEATURES

~ Review announcements ~

The screenshot shows a web-based application interface for managing announcements. At the top center is a logo consisting of a blue circle containing a stylized figure and a gear, with the word "ANNOUNCEMENTS" written in a circular pattern around it. Below the logo is a search bar with the placeholder "Search:" and a dropdown menu showing "Show 10 entries". The main content area is a table with the following columns: No., Title, Seller, Price, Category, Created Date, Status, Views, and Action. The table contains 10 rows of data, each with a unique number, title, seller name, price, category, creation date, status (either Approved or Pending Approval), view count, and a "View" | "Edit" | "Delete" link under the "Action" column. The bottom of the table shows pagination information: "Showing 1 to 10 of 13 entries", a "Previous" button, a page number "1" (which is highlighted in a light gray box), a "2", and a "Next" button.

No.	Title	Seller	Price	Category	Created Date	Status	Views	Action
1	Catalizator Golf 4	Test Seller	300.00	Car parts	August 13, 2021, 04:57	Approved	3	View Edit Delete
2	VW Golf 6 1.6 Diesel	Test Seller	3500.00	auto	August 13, 2021, 05:44	Approved	4	View Edit Delete
3	Golf 4	Test Seller	1000.00	auto	August 13, 2021, 05:53	Approved	7	View Edit Delete
4	Vand Opel	Test Seller	1150.00	auto	August 13, 2021, 06:30	Approved	3	View Edit Delete
5	Audi A6	Test Seller	8000.00	auto	August 14, 2021, 12:28	Approved	4	View Edit Delete
6	Vand Motor	Test Seller	2700.00	moto	August 16, 2021, 11:44	Approved	4	View Edit Delete
7	Vand Peugeot	Test Seller	1500.00	auto	August 16, 2021, 11:50	Approved	1	View Edit Delete
8	Peugeot 307 CC	Test Seller	1000.00	auto	August 16, 2021, 11:51	Approved	2	View Edit Delete
9	Mercedes SLK	Test Seller	4599.00	auto	August 17, 2021, 03:46	Approved	8	View Edit Delete
10	Opel Astra	Test Seller	123.00	Car parts	August 17, 2021, 02:30	Pending Approval	3	View Edit Delete

Showing 1 to 10 of 13 entries

Previous [1](#) [2](#) Next

Figure 12. Announcements panel

DEMO ON APP



MAIN FEATURES

~ Chat System ~

- ❖ The chat system works based on creating, saving, loading and managing entries in the Messages table, that contains a *recipientId* that is the receiver of the conversation and the *CreatedBy* property, represented by the current logged user Id.
- ❖ There is also the text of the messages and a timestamp that will be the date and time when a message was created
- ❖ Users can contact each other through the inbox or “Contact Seller” button
- ❖ Initially a first message is sent to the recipient informing that the user wants to start a chat
- ❖ The chat system is an online chat, representing that is automatically refreshed in order to receive the new messages almost instantaneously

Message	
PK	MessageId
FK1	RecipientId
	MessageText
	CreatedBy
	CreatedDate
	IsRead

Figure 13. Messages table

MAIN FEATURES

~ Chat System ~

- ❖ Below is the interface for the inbox messages:

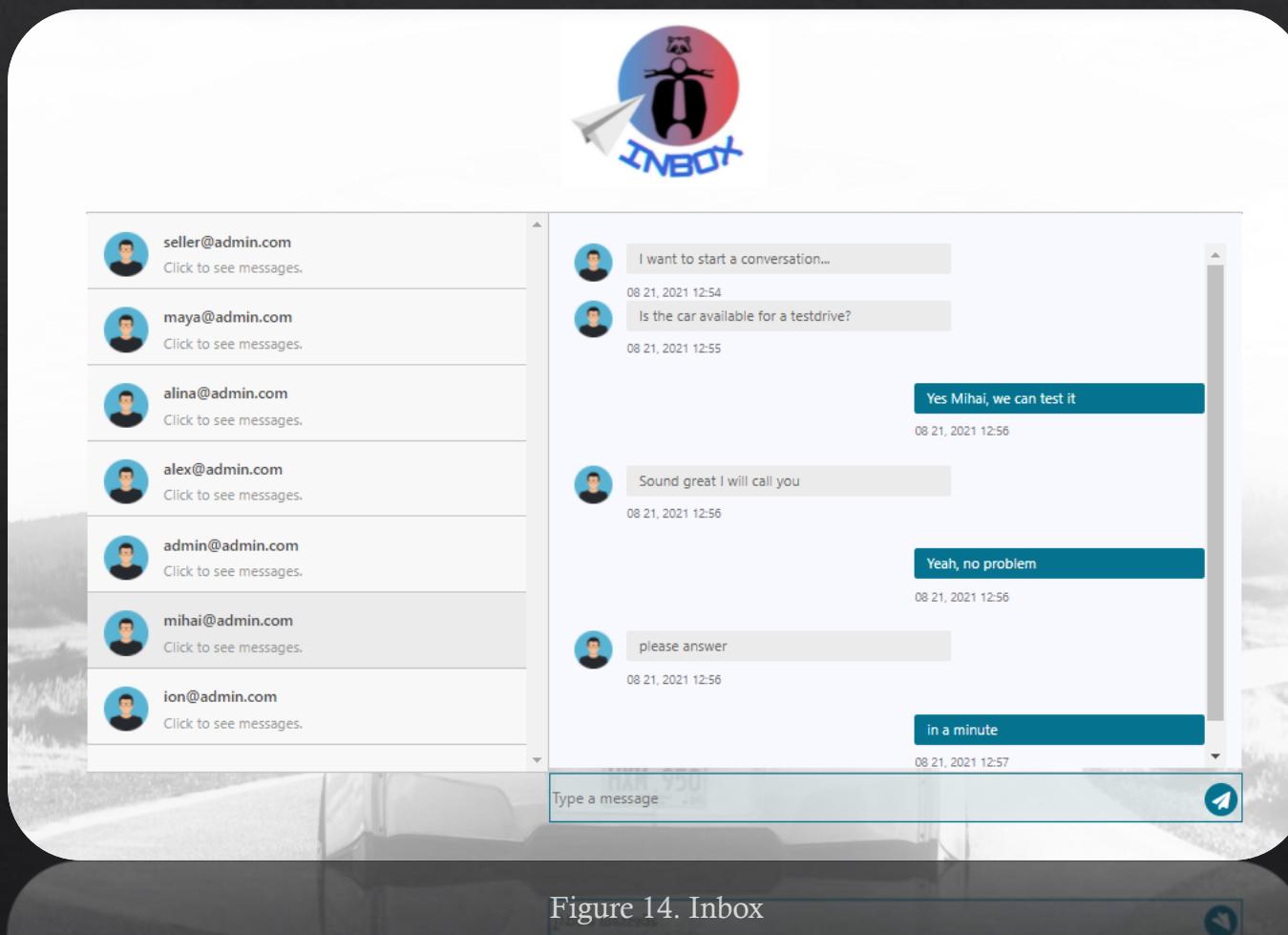


Figure 14. Inbox

DEMO ON APP



MAIN FEATURES

~ Recommender System ~

- ❖ The Recommender system is providing recommended announcements to logged users based on their search and filter history
- ❖ When a search or filtering is made, the parameters are saved in the *SearchFilters* table
- ❖ The filters are saved by the current user, that will fill the *CreatedBy* property
- ❖ Recommended announcements will be displayed in a different section in the homepage
- ❖ When the filters are applied, the recommended announcements are not displayed because we want to see only the results of the filtering

SearchFilter	
PK	SearchFilterId
FK1	CreatedBy
	Title
	Make
	CreatedDate
	Price
	Year
	Mileage
	Power
	CategoryNr

Figure 15. SearchFilters table

MAIN FEATURES

~ Recommender System ~

- ❖ The main logic of the recommender system is represented by extracting the most searched value on each column of the *SearchFilters* table, by counting the occurrence of a searched or filtered keyword
- ❖ This process is applied on each column and in the end it will start choosing announcements from the all approved announcements in the homepage that will contain the most searched Title, Price, category etc.
- ❖ If on a column, for example Price was filtered many times but on different values, then it will be extracted the first value because the priority is the same for the user
- ❖ For example a person searched the Title “opel” 3 times and “mercedes” 2 times, the recommender will start to show first announcements that contains the keyword “opel” and at least the keyword “mercedes” because has lower priority
- ❖ Then the same for the Make column and the others, in the end will recommend better and more specific announcements

MAIN FEATURES

~ Recommender System ~

- ❖ Below is an example of recommended announcements, that are containing the keyword “golf”

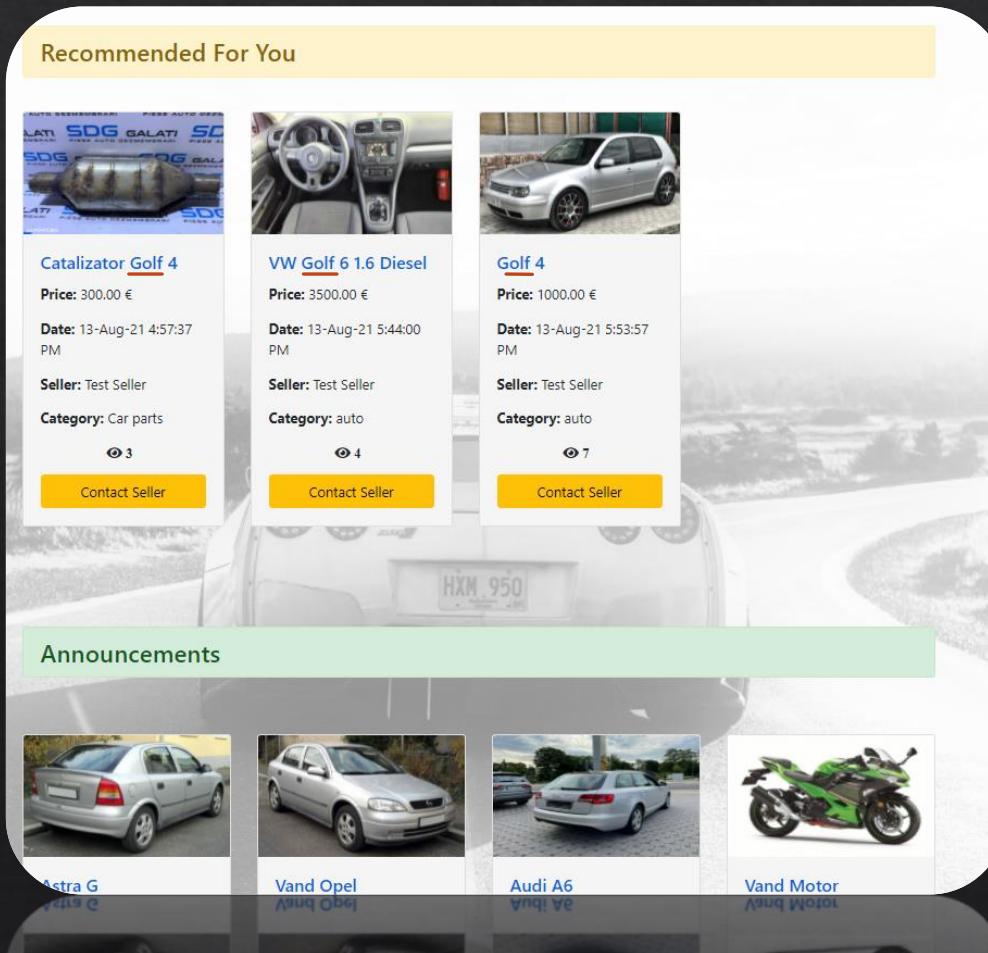


Figure 16. Recommended announcements example

DEMO ON APP



CONCLUSIONS AND IMPROVEMENTS

- ❖ In conclusion, the application **Racooter – Cars trading website** implements all the main functionalities based on the functional requirements, using the principles, design patterns and application architecture presented in the correspondent sections of the presentation.
- ❖ The application is representing a platform where buyers and sellers meet to satisfy their needs regarding selling and buying the perfect car for them. The website is rich in features that provides a great user experience, along side with the graphical user interface design that is intuitive, efficient and easy to use.
- ❖ Future improvements can be to the chat system that can integrate a third party to deal with sending/receiving messages, for example using the SignalR library.
- ❖ Another significant improvement can be brought to the recommender system that can use some machine learning algorithms that can determine the similarities between the announcements based on user preferences. A library that can be used in this way compatible with ASP.NET and C# language is ML.NET



THANKS FOR YOUR ATTENTION!

