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AI Challenge 1:

Forecasting Air Pollution in Istanbul for the Coming Years

Story:

In recent years, Istanbul's air quality has shown significant fluctuations. Urban planning decisions—such as transportation systems, healthcare infrastructure, and environmental policies—require an understanding of air pollution trends in the coming years. Long-term forecasting (annual or multi-year) enables policymakers to design preventive strategies and make targeted investments more effectively.

Technical Objective of the Challenge:

Teams are required to build a system that predicts air quality indicators for each year (at least 1–3 years into the future) at the city level of Istanbul. These indicators may include annual averages of PM2.5 and/or AQI. The models should be capable of incorporating exogenous variables (such as seasonal, economic, traffic-related, and policy factors), reporting prediction uncertainty, and generating clear, visual, and interpretable outputs for decision-makers.

Participants' Tasks:

- Collect air quality data for Istanbul (from monitoring stations or city-wide averages).
- Clean and preprocess the data.
- Visualize long-term and seasonal trends of PM2.5 / AQI.
- Analyze correlations with exogenous features (e.g., correlations with temperature, wind speed, or public holidays).

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AI Challenge 2:

Recommendation System for a Digital Library

Story:

A large digital library is under development, but users often feel overwhelmed by the vast number of available books. The library needs an intelligent system that can recommend suitable books to each user.

Technical Objective of the Challenge:

Design and implement a simple recommendation system using Python and machine learning techniques.

Participants' Tasks:

- Analyze user data (ratings, tags, and categories).
- Build a recommendation model and experiment with different approaches.
- Implement a small service that takes user input and returns book recommendations.
- Develop a simple dashboard to visualize and explore the recommended items.

AI Challenge 3:

Predicting Urgent Hospital Resource Needs During a Crisis

Story:

In the early hours following a large-scale crisis, hospitals are faced with a sudden surge of injured patients. Shortages of hospital beds, medical equipment, or healthcare staff can put patients' lives at serious risk. Intelligent prediction of hospital resource needs is a key factor in effective crisis management.

Technical Objective of the Challenge:

Design a machine learning system capable of predicting hospitals' urgent needs for critical resources based on incoming data and crisis conditions.

Participants' Tasks:

1. Healthcare Data Analysis:
    - Analyze patient admission statistics.
    - Examine types of injuries and their severity levels.
2. Machine Learning Model Implementation:
    - Predict the number of patients in the coming hours.
    - Estimate required hospital beds, medical equipment, and staffing levels.
    - Identify hospitals that are approaching or exceeding capacity limits.

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AI Challenge 4:

Airline Ticket Price Prediction on High-Demand Routes

Story:

The prices of domestic flight tickets in Turkey change constantly, and users are often unsure about the best time to purchase. A travel platform aims to predict future ticket prices.

Technical Objective of the Challenge:

Build a machine learning model to predict airline ticket prices using ML algorithms.

Participants' Tasks:

- Create a dataset with time-based features.
- Compare different machine learning models for time series forecasting.
- Analyze prediction errors and present forecasts for the next 30 days.
- Develop a visualization tool to display price trends.

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AI Challenge 5:

Predicting Building Collapse After an Earthquake

Story:

Following a severe earthquake, rapid decision-making about whether buildings are safe or unsafe plays a critical role in saving lives. Manually inspecting all structures is time-consuming and, in the early hours of a crisis, practically impossible. The only viable solution is to use intelligent predictive systems that can estimate the likelihood of building collapse based on available data.

Technical Objective of the Challenge:

Design a machine learning system that uses structural and seismic data to predict the probability of building collapse or severe damage after an earthquake.

Participants' Tasks:

1. Data Analysis and Preparation:
    - Examine building characteristics (age, structural type, number of floors, etc.).
    - Analyze earthquake intensity and related features.
    - Handle missing or imbalanced data.
2. Machine Learning Model Implementation:
    - Predict building status (safe / high-risk / collapsed), or
    - Estimate a numerical probability of building collapse.

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AI Challenge 6:

Deep Learning–Based Intelligent System for Predicting Istanbul Metro Congestion

Story:

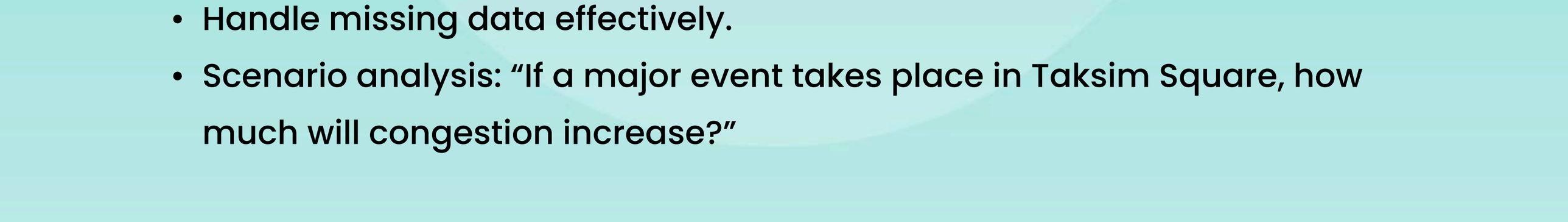
With population growth and increasing tourism, Istanbul's metro stations experience unpredictable congestion at different times of the day. The public transportation system needs an algorithm that can predict future passenger congestion based on historical usage data, urban events, and weather conditions.

Technical Objective of the Challenge:

Build a model to predict the number of passengers at each metro station from 30 minutes up to 24 hours ahead, using multi-source data such as ridership history, weather data, urban events, and spatial information.

Participants' Tasks:

- Collect multi-source data.
- Build multivariate time series for each station.
- Handle missing data effectively.
- Scenario analysis: "If a major event takes place in Taksim Square, how much will congestion increase?"



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AI Challenge 7:

News Classification System

Story:

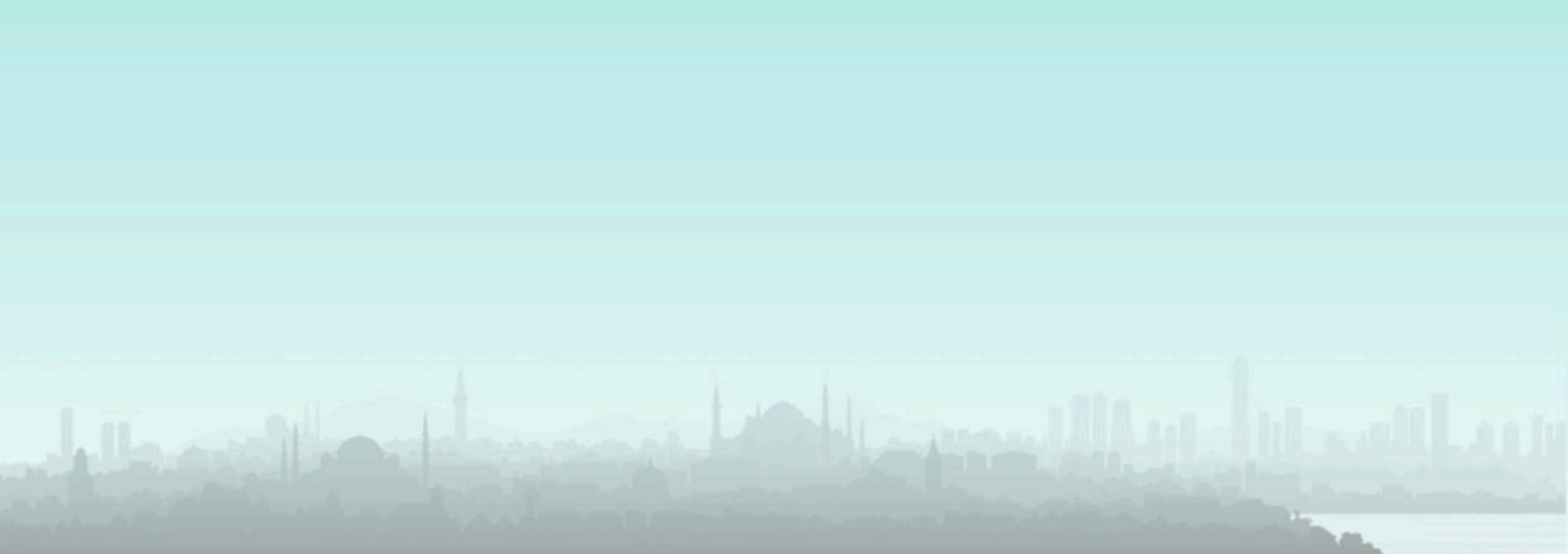
Turkish media outlets publish thousands of news articles every day, making it difficult for users to organize content or quickly find important news. An automatic news classification engine can make media consumption smarter and more efficient.

Technical Objective of the Challenge:

Design a model to classify Turkish news articles into multiple categories (e.g., economy, politics, sports, technology, culture).

Participants' Tasks:

- Collect 20,000–50,000 news articles in Turkish, English, or bilingual formats.
- Clean the text data (e.g., remove HTML tags).
- Extract text embeddings and compare BERT-based models with classical machine learning approaches.
- Perform error analysis and evaluate results using a confusion matrix.



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AI Challenge 8:

Fake Social Media Profile Detection

Story:

Social media platforms are facing a surge of fake accounts that distort analytics through fake comments and followers. An intelligent system is required to identify and distinguish such user behaviors.

Technical Objective of the Challenge:

Design a model to detect fake users based on the follower graph structure and users' temporal behaviors, such as posting activity, likes, follower growth rate, and activity patterns.

Participants' Tasks:

- Construct a user interaction and follower graph.
- Design behavioral features (e.g., average posting interval, content diversity, engagement rate).
- Analyze feature importance and identify "fake communities."
- Develop a scoring system to label accounts as real / suspicious / fake.

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AI Challenge 9:

Deep Learning Embedding–Based Intelligent Recommendation System for Tourist Attractions in Istanbul

Story:

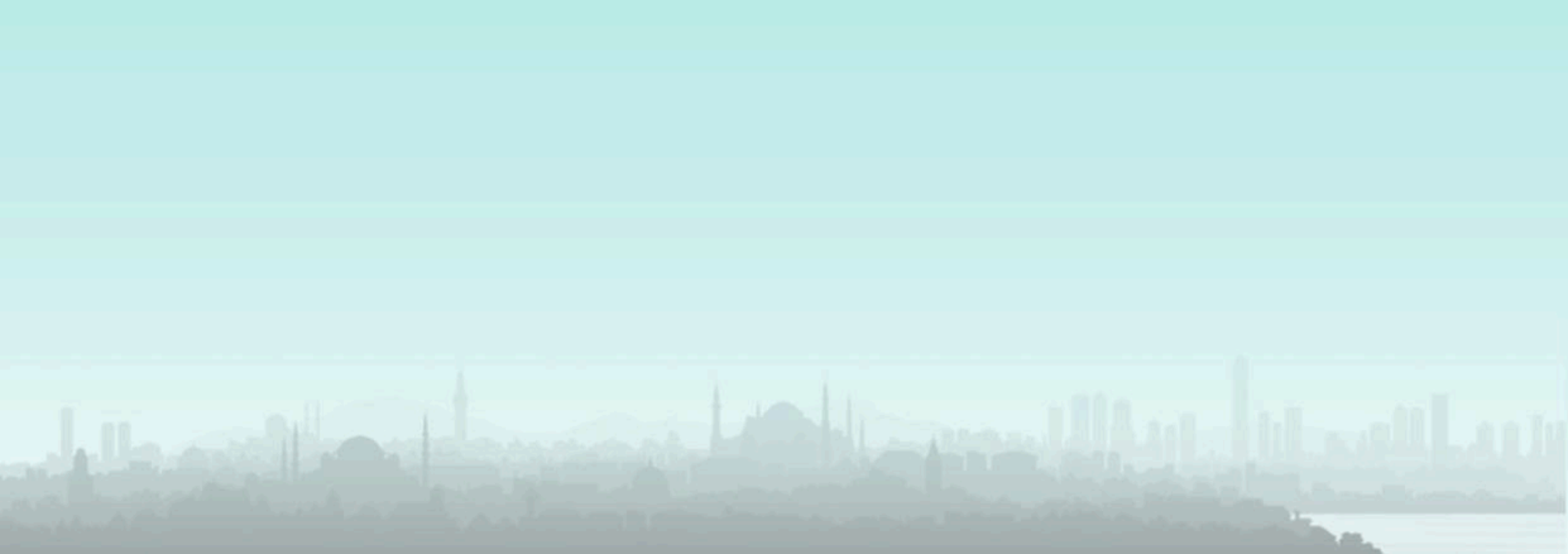
Travelers in Istanbul share a large volume of reviews and experiences on social platforms every day. Designing an intelligent recommendation system can help suggest tourist attractions tailored to each visitor’s preferences.

Technical Objective of the Challenge:

Build a recommender system that takes as input user data (age, country, ratings) and place data (district, price range, type of venue, and textual descriptions).

Participants’ Tasks:

- Collect an existing dataset or construct a combined dataset.
- Process and embed textual descriptions of tourist attractions.
- Evaluate and measure the model’s accuracy.
- Build a user-facing recommendation system that is practical and usable.



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AI Challenge 10:

Energy Demand Forecasting

Story:

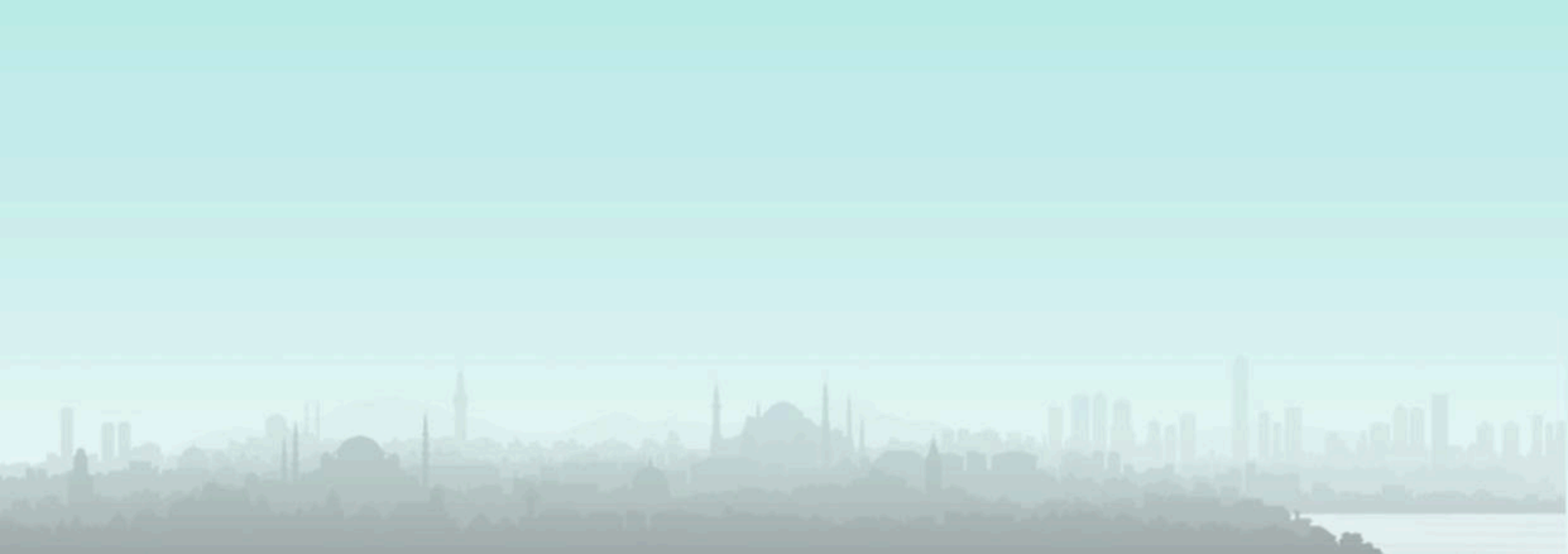
Electricity consumption in cities around the world is heavily influenced by seasons, temperature, events, and time of day. Power companies need accurate energy demand forecasts to optimize grid management and energy production.

Technical Objective of the Challenge:

Build a deep learning model to predict daily or hourly energy consumption in Istanbul. The model should accept external variables (e.g., temperature, humidity, day of the week, holidays) and provide forecasts for the coming week or month.

Participants' Tasks:

- Collect energy consumption datasets from at least five different cities.
- Clean and preprocess the data.
- Develop a dashboard to visualize daily/weekly forecasts, including scenario analyses (e.g., high/low temperature, holidays, events).



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AI Challenge 11:

Crowd Behavior Detection in Images and Videos

Story:

At large events and crowded locations, detecting crowd behavior (density, congestion, abnormal activity) is crucial for effective crisis management and public safety.

Technical Objective of the Challenge:

Build a model to analyze crowd behavior using computer vision techniques.

Participants' Tasks:

- Detect crowd behaviors such as congestion, gathering, rapid movement, or suspicious activities.
- Input data: street videos, metro station footage, or event recordings.
- Output: classify crowd behaviors and generate density heatmaps.

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AI Challenge 12:

Prioritizing Emergency Calls Based on Voice Analysis

Story:

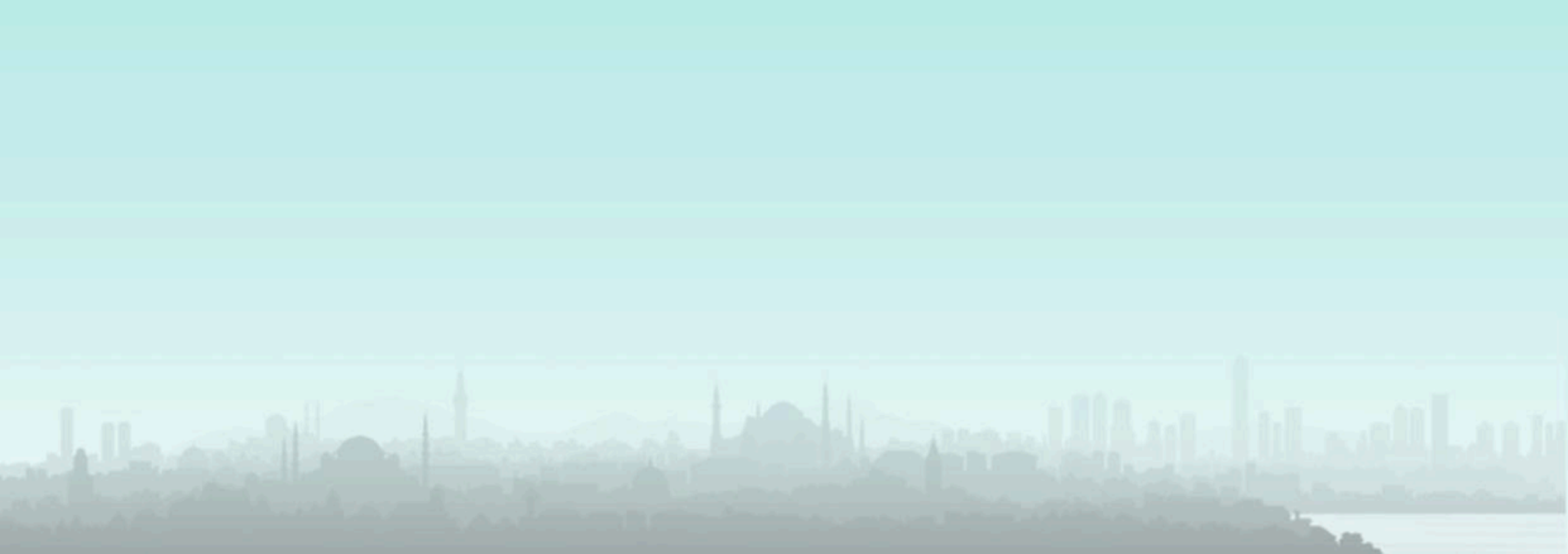
During crises such as earthquakes, floods, or large-scale accidents, emergency centers are inundated with a massive volume of voice calls. While all calls are urgent, not all share the same level of urgency. Rapidly identifying critical calls can directly save lives.

Technical Objective of the Challenge:

Design an intelligent voice analysis system that can analyze emergency calls and prioritize them based on the speaker's level of urgency.

Participants' Tasks:

1. Audio Signal Processing:
    - Remove noise and environmental disturbances.
    - Segment audio calls into meaningful units.
2. Language or Speech Pattern Detection
3. Emotion Detection:
    - Identify stress, fear, or calmness in the speaker's voice.



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AI Challenge 13:

Face Authentication Using Passport / National ID

Story:

At airports, land borders, and online authentication systems, verifying a person's identity by matching their face with official documents is a critical security step. With increasing passenger volumes and digital services, manual verification is not only time-consuming but also prone to errors. The only reliable solution is an intelligent system capable of face recognition and matching under real-world, non-ideal conditions.

Technical Objective of the Challenge:

Design an AI system to match a person's live face with the photo on their passport or national ID and determine whether the two images belong to the same individual.

Participants' Tasks:

- Face Image Processing
- Implement a Computer Vision Model
- Compute Similarity Between the Live Image and Document Photo
- Decision Making: Match / No Match

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AI Challenge 14:

Restoration and Enhancement of Historical Images

Story:

Many historical images of Istanbul exist with low resolution and significant noise.

Restoring these images is vital for archiving and content production.

Technical Objective of the Challenge:

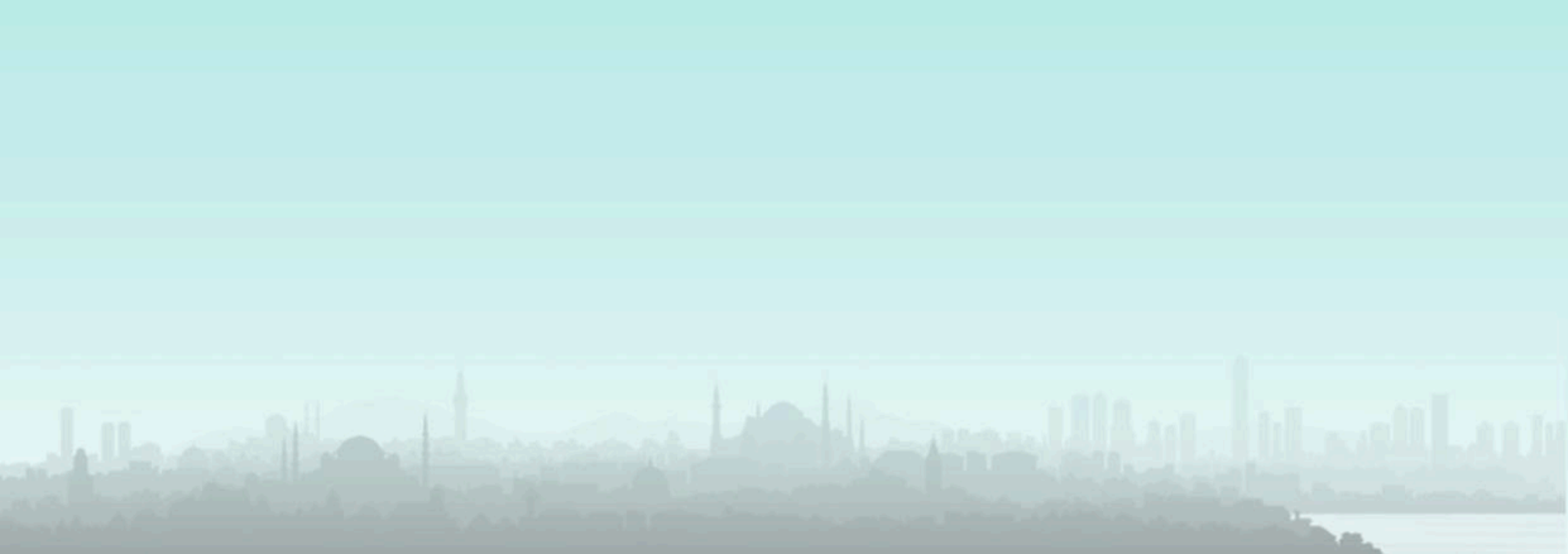
Input: Low-resolution, noisy images

Output: Higher-resolution images with reduced noise

Challenge: Preserve historical details and textures

Participants' Tasks:

- Collect a dataset of historical images.
- Develop a sample application or dashboard to upload an image and receive the enhanced output.
- Evaluate visual quality of the restored images.



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AI Challenge 15:

Detecting Speaker Status and Providing Appropriate Emergency Messages

Story:

During a severe earthquake, many emergency voice messages from affected individuals are recorded with noise, interruptions, and low quality. The only way to save lives is through intelligent extraction and analysis of these audio messages and providing appropriate responses to the speaker's situation.

The system should not only detect the speaker's status but also deliver context-appropriate emergency instructions.

For example, if someone is trapped under debris, the system might instruct them to "take a deep breath" or "stay calm and avoid moving."

Technical Objective of the Challenge:

Design an intelligent audio processing system that can:

1. Extract meaningful information from noisy voice files,
2. Analyze the speaker's status, and
3. Generate and deliver appropriate emergency messages based on the individual's condition.

Participants' Tasks:

1. Audio Signal Processing:
   - Remove noise and environmental disturbances
   - Segment voice files into meaningful units
2. Machine Learning / Deep Learning Model Implementation:
   - Detect speaker's status (stress, fear, emergency, calmness, etc.)
3. Emergency Message Generation:

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AI & Web Challenge 1:

Intelligent Learning Assistant

Story:

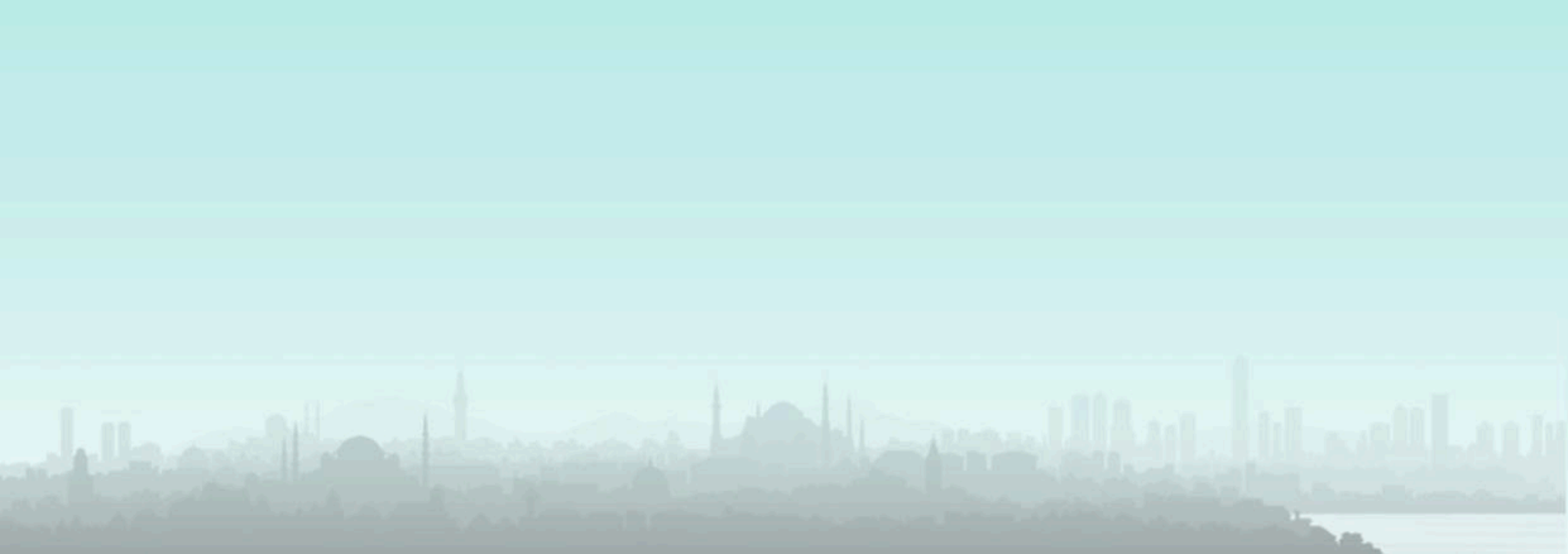
Many students struggle to engage with online educational content. An educational startup aims to build an intelligent assistant that understands user behavior and personalizes learning experiences.

Technical Objective of the Challenge:

Develop a web-based educational application that uses machine learning to analyze a user's interests and weaknesses, and recommend appropriate content.

Participants' Tasks:

1. Design an interactive web application using HTML / CSS / JS.
2. Implement a system to record user interactions (clicks, responses, time spent).
3. Apply machine learning to:
    - Classify user skill or engagement level
    - Recommend content or predict future performance
    - Visualize analysis results to the user in a graphical format



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AI & Web Challenge 2:

Intelligent Harmful Content Detection System

Story:

A startup social media platform faces a high volume of user-generated content, and the human moderation team cannot review all messages. The goal is to build a system that quickly and intelligently detects harmful content.

Technical Objective of the Challenge:

Develop a web-based content management application that uses machine learning to identify inappropriate text or image content.

Participants' Tasks:

1. Design a web-based admin panel using HTML / CSS / JS.
2. Enable users to submit text or images.
3. Implement an ML model to:
    - Detect insults, hate speech, or spam (text)
    - Display analysis results as a score or label

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Programming Challenge 1:

Interactive Istanbul Tourism Information Portal

Story:

Tourists and students in Istanbul often struggle to find comprehensive and interactive information about attractions, restaurants, and local events. There is a need for a simple yet engaging and interactive portal.

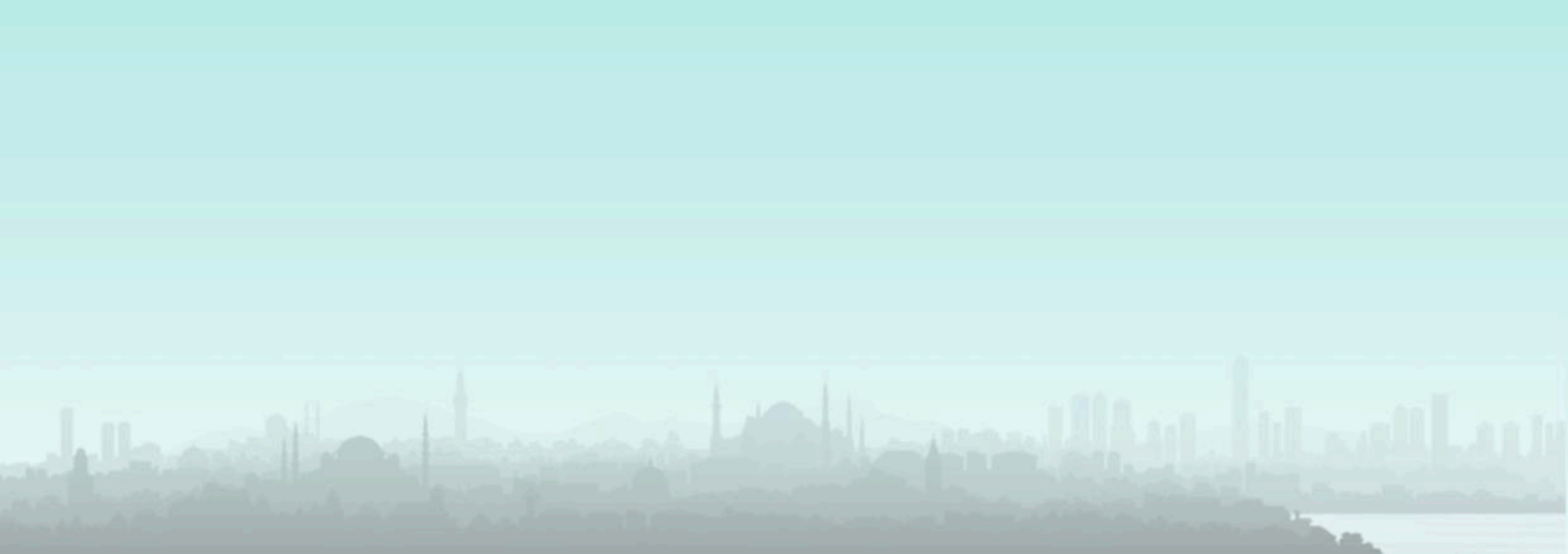
Technical Objective of the Challenge:

Display information about Istanbul’s tourist attractions.

Provide dynamic search and filtering based on category, district, price, and rating

Participants’ Tasks:

- Implement search and filtering functionality
- Collect data from open data sources



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Programming Challenge 2:

Personal Budget Management with LocalStorage

Story:

Individuals and students worldwide need a simple and fast tool to manage expenses that can store data locally without requiring a server.

Technical Objective of the Challenge:

Build a Personal Finance Web App with data storage capabilities

Participants' Tasks:

- Store and retrieve data from LocalStorage
- Implement filtering by category, date, or amount
- Add functionality to delete or edit transactions

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Programming Challenge 3:
Online Event Booking System

Story:

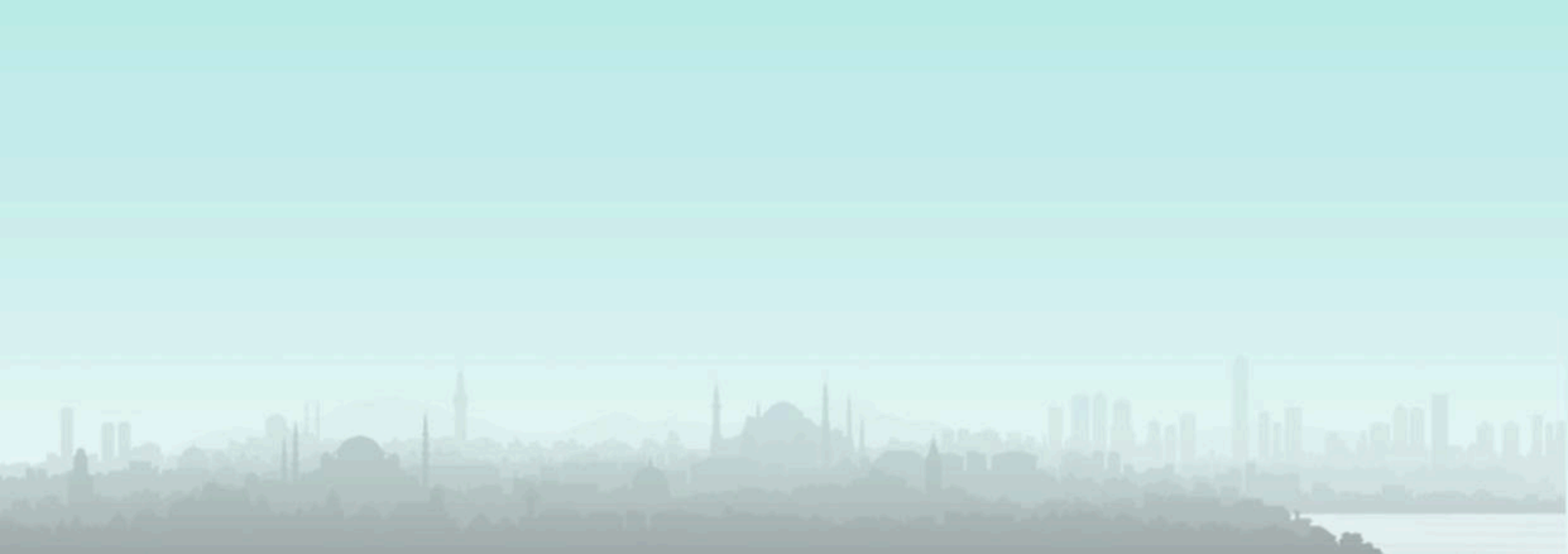
Users need a tool to manage attending events and concerts, including scheduling, number of attendees, and ticket purchases online.

Technical Objective of the Challenge:

Build a web-based event booking application: display events with details (date, location, price), allow booking and recording the number of attendees, manage event capacity, and prevent overbooking.

Participants' Tasks:

- Design an attractive and responsive user interface
- Store and manage bookings using LocalStorage
- Implement capacity limits for each event



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Programming Challenge 4:
Live Weather Data Dashboard

Story:

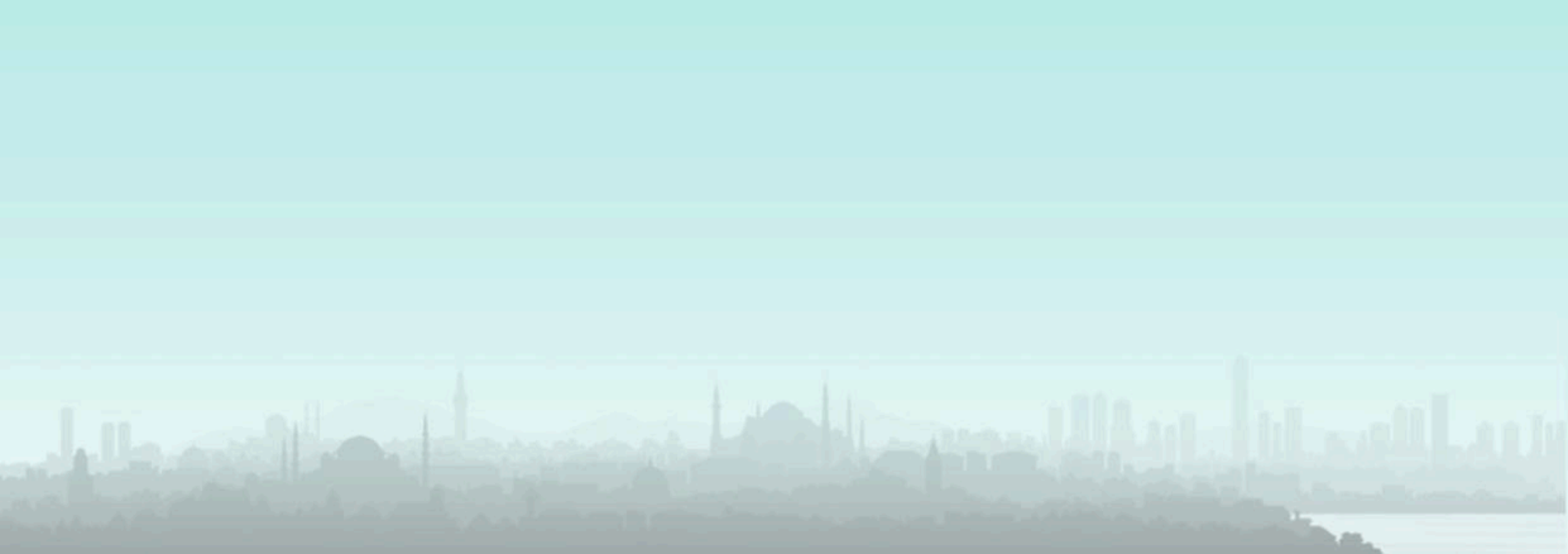
Tourists and residents in Istanbul need to see real-time and interactive weather information to better plan their trips and daily activities.

Technical Objective of the Challenge:

Build a Weather Dashboard that displays temperature, humidity, pressure, wind speed, and forecast for upcoming days.

Participants' Tasks:

- Fetch data from an API and handle JSON responses
- Design an attractive and responsive user interface



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Programming Challenge 5:

Simple Online Chat Web App

Story:

Website users need a simple online chat and messaging system to communicate with friends or team members.

Technical Objective of the Challenge:

Build a Simple Chat Web App using HTML, CSS, and JS

Participants' Tasks:

- Implement JS functionality to send, receive, and display messages
- Store and load messages from LocalStorage
- Add animations for sending and receiving messages
- **Optional:** Add an emoji picker or message history feature