

# Key Results

## Web Application Screenshots

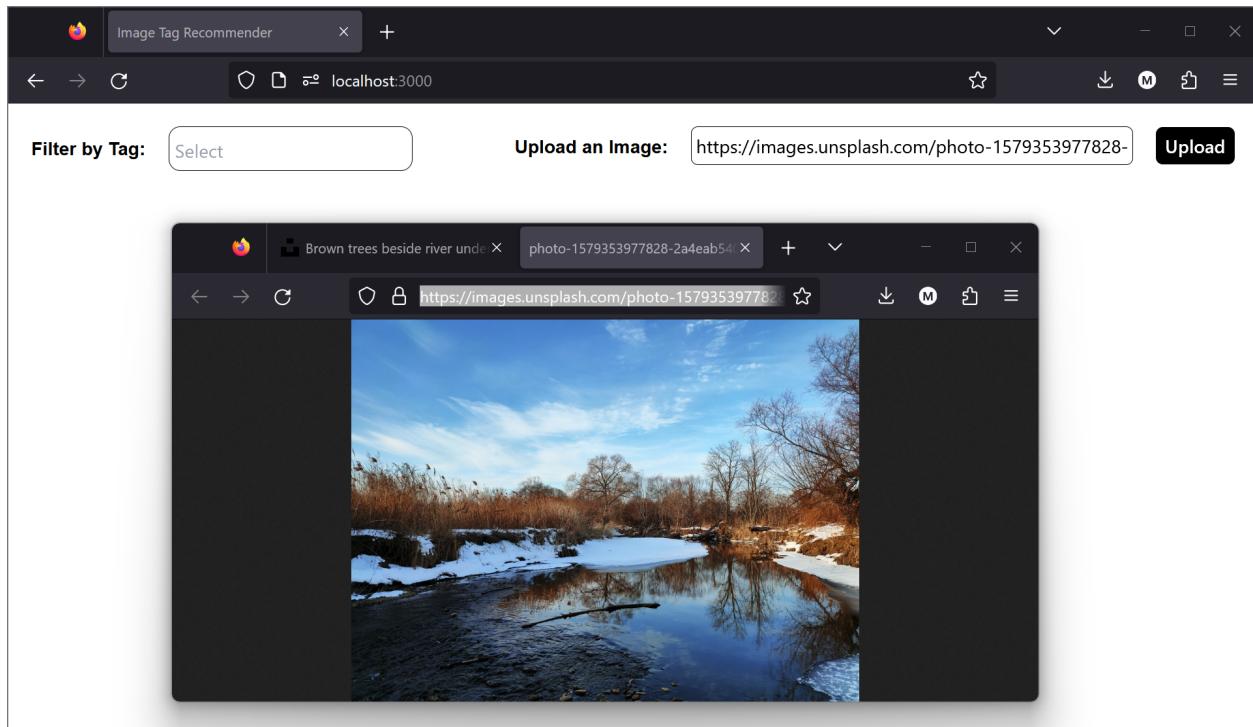
### Home Page

The Home Page is the main page of the application. It allows a user to upload new images, view the images in the database, and filter images by tags.

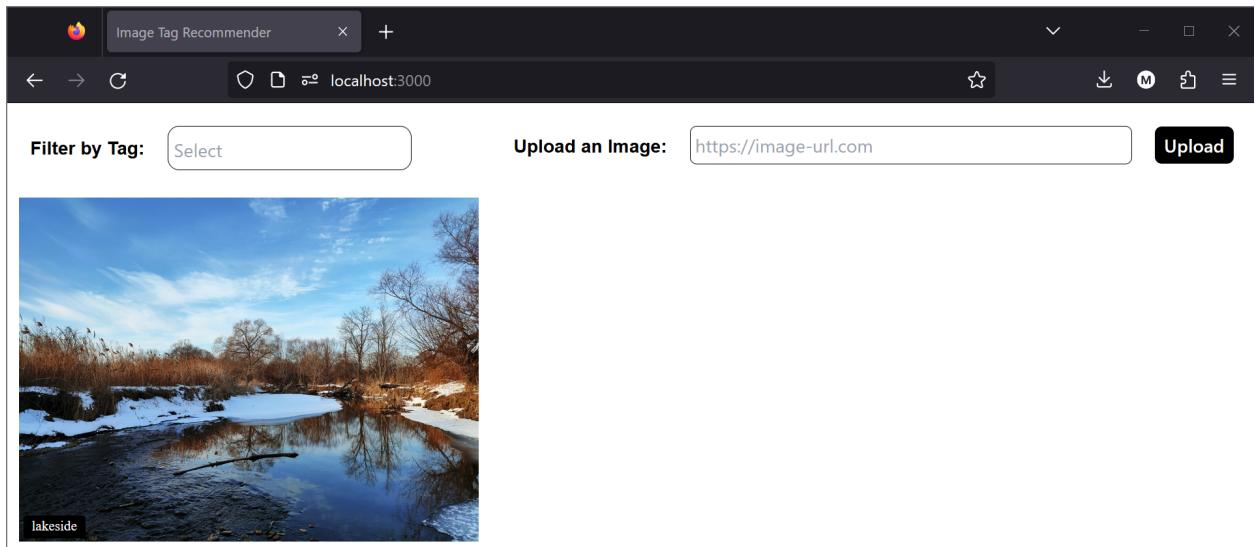
1. Home page with no images uploaded. No options for filtering by tag since none are in the database yet

A screenshot of a web browser window titled "Image Tag Recommender". At the top, there is a "Filter by Tag:" dropdown menu with the placeholder "Select" and a "Upload an Image:" input field containing the URL "https://image-url.com". Below these fields is a button labeled "Upload". A message "No Options Available" is displayed in the center of the page.

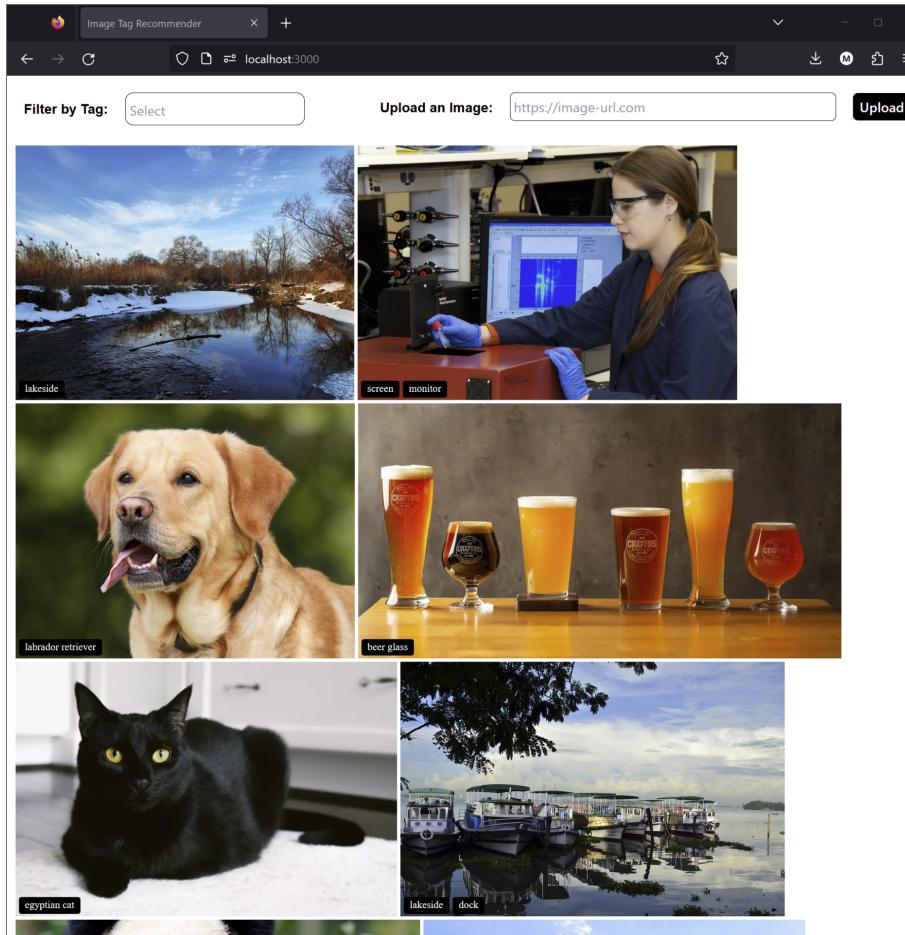
2. User inputs a url into the "Upload an Image" field and presses the "Upload" button to send the url to the API to start the tag recommendation process. This will open the Tag Selection page.



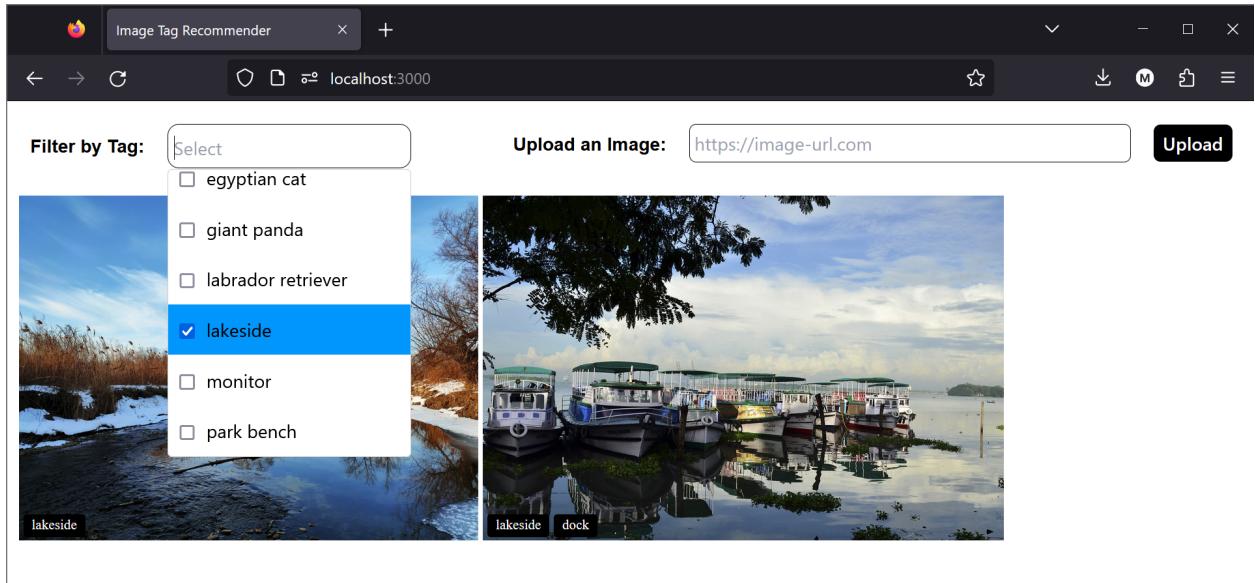
3. Single image in the database, displayed with tags listed.



4. Home page with multiple images in the gallery, showing image tags listed.

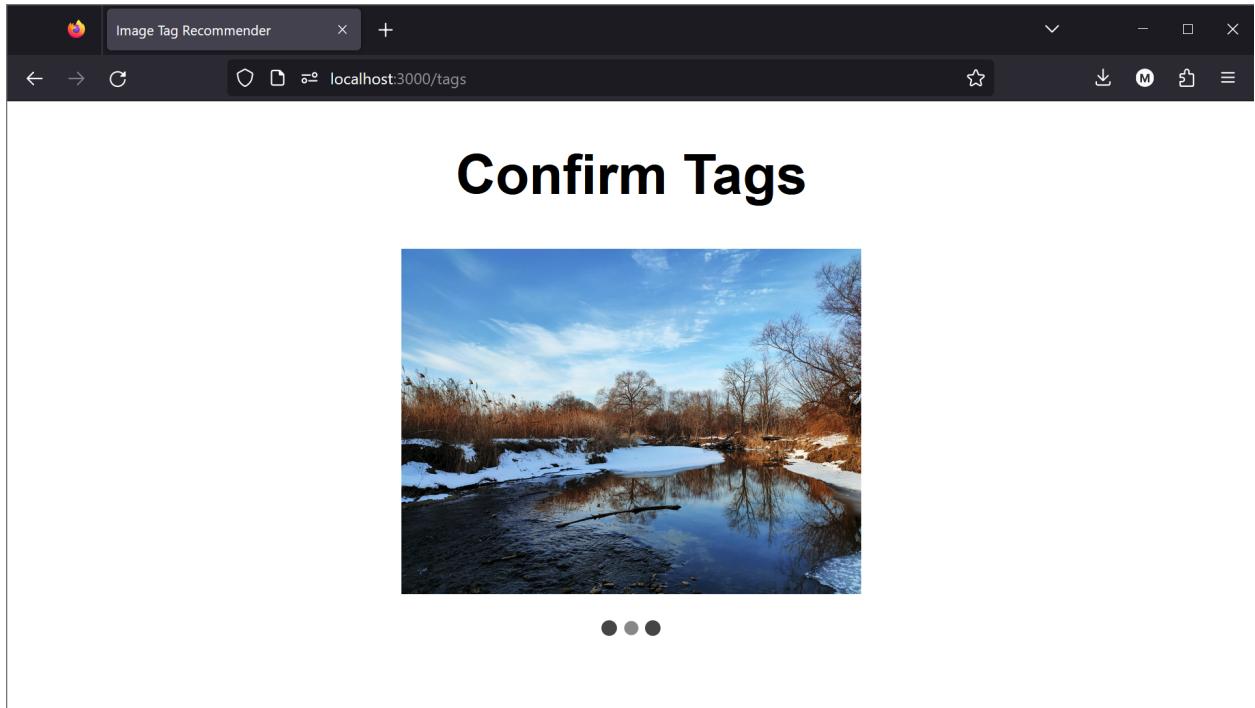


5. Filtering the images in the home page gallery with the "Filter by Tag" field.

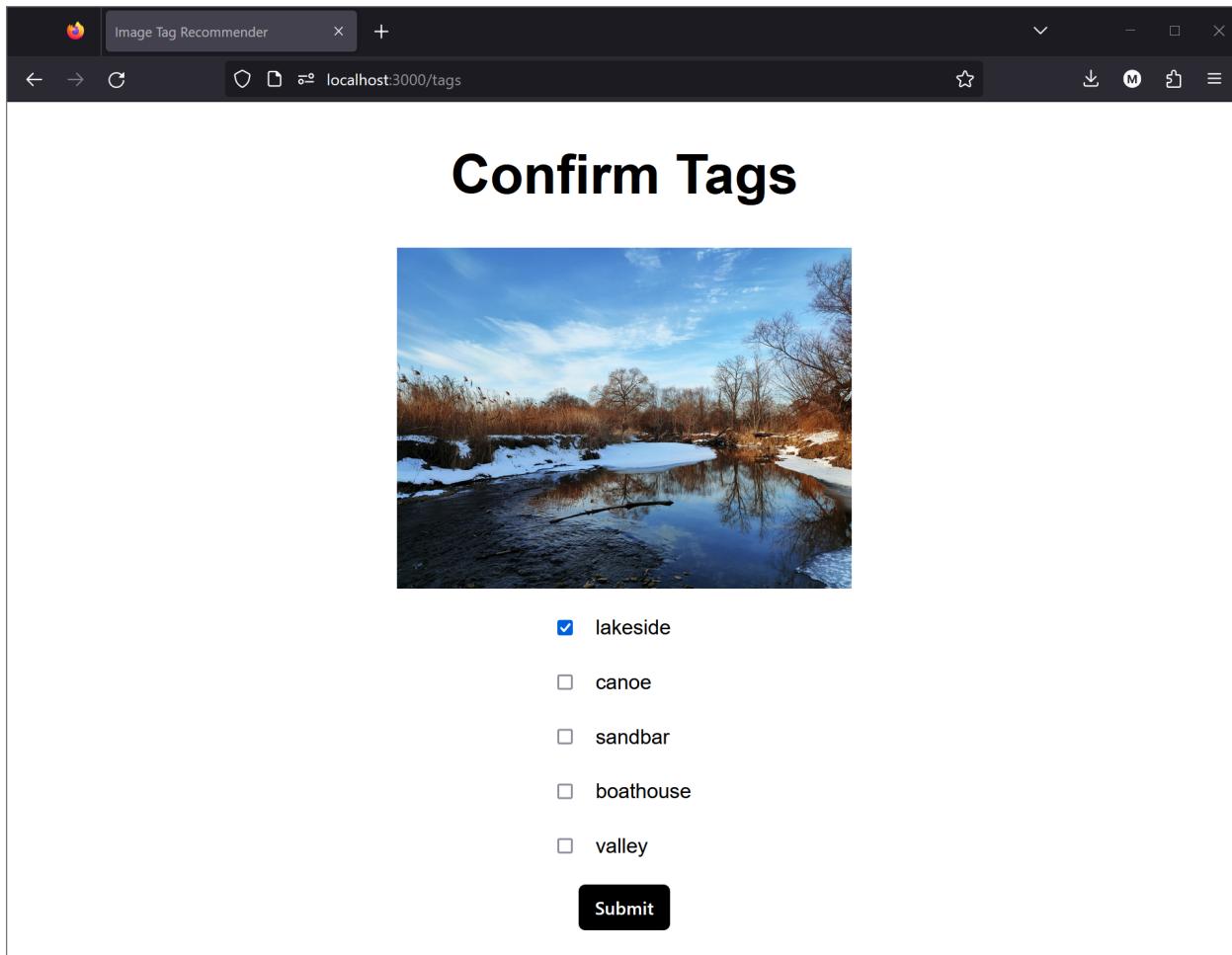


## Tag Selection Page

1. Tag selection page waiting for API to finish running model and respond with top 5 tags.



2. List of tags returned from API. User selects ones to associate with the image by checking the checkboxes.



## Evaluation

To evaluate our models, we used run-time and accuracy as our metrics. Since the models that we tested all have state-of-the-art accuracy scores out of the box, we analyzed the tags which are recommended by each of the models to determine whether they work well for recommending suitable tags for images that users input into our system. We used the run-time metric to measure how long it takes each model to give tag recommendations, which was measured by recording the latency between inputting the image and getting the tag recommendations. We ran this test for multiple images per model and took the mean latency time to ensure that we had a valid running time for each model, and also to test the throughput of the system. By analyzing these two evaluation metrics we determined which model is most suitable for our system. Additionally, we experimented with different database options and evaluating them qualitatively to determine which is best suited to store our image data along with each image's tags and metadata and to interface with our machine-learning models. Below

are the tags predicted by our 3 models on 5 different images. We will refer to the vit-base-patch16-224 developed by Google as Model 1, resnet-50 developed by Microsoft as Model 2, and ConvNext-tiny-224 developed by Facebook as Model 3.

## Image 1

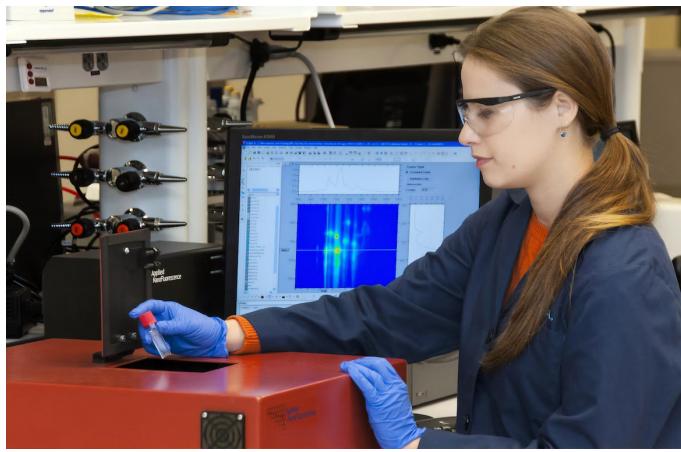


**Model 1:** lakeside, valley, sandbar, dam, seashore

**Model 2:** lakeside, canoe, boathouse, sandbar, valley

**Model 3:** lakeside, sandbar, valley, canoe, boathouse

## Image 2



**Model 1:** oscilloscope, lab coat, desktop computer, hand-held computer, beaker

**Model 2:** monitor, screen, laptop, desktop computer, notebook

**Model 3:** oscilloscope, screen, mouse, web site, monitor

Image 3



**Model 1:** beer glass, beer bottle, goblet, eggnog, whiskey jug

**Model 2:** beer glass, espresso, goblet, sunscreen, cup

**Model 3:** beer glass, goblet, espresso, eggnog, beer bottle

Image 4



**Model 1:** egyptian cat, tiger cat, tabby, space heater, siamese cat

**Model 2:** egyptian cat, tub, washbasin, mouse, paper towel

**Model 3:** egyptian cat, lynx, schipperke, tub, siamese cat

## Image 5



**Model 1:** labrador retriever, golden retriever, rhodesian ridgeback, tennis ball, chesapeake bay retriever

**Model 2:** labrador retriever, golden retriever, rhodesian ridgeback, greater swiss mountain dog, soccer ball

**Model 3:** labrador retriever, golden retriever, greater swiss mountain dog, curly-coated retriever, chesapeake bay retriever

## Running Times

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
<b>Image 1</b>	2.12s	0.76s	0.76s
<b>Image 2</b>	2.38s	0.7s	0.84s
<b>Image 3</b>	2.05s	0.85s	0.89s
<b>Image 4</b>	2.03s	0.82s	0.89s
<b>Image 5</b>	2.08s	0.89s	0.93s

Note: Model 1 is vit-base-patch16-224, model 2 is ResNet-50, model 3 is ConvNext-Tiny-224