A Social-Driven Intelligent System to Assist the Classification of Pet Emotions using Deep Learning and Big Data Analysis

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ABSTRACT

Pets have always been a big part of families, and people always imagine what their pet is thinking by their actions and face [1]. However, No one can tell what a pet might be thinking unless they are very familiar with them [2]. This paper develops/designs/proposes an application/software/tool to... [There is an AI that could try to understand the pet's emotion, and people can share their photos to other pet lovers on the app, which will further make the AI more accurate [3]. We applied our application to people who have pets of all kind and conducted a qualitative evaluation of the approach. The results show that [the AI is decently accurate and the app is fairly easy to use from feed backs made by testers. And the AI have the potential to get more accurate in the future with the more data customers posts, and thus will give more accurate results back to the users].

KEYWORDS

Social-Driven, Machine Learning, Classification.

1. INTRODUCTION

Pets are a very important part of our family, and pets are very popular in recent years [10]. People always wonder what their pet might be thinking, or want to share their pet's funny moment with other people, specifically people who have the same feeling– pet owners. That's why I built an app for this society, and with AI, which with everyone's help, can be more accurate in determining what their pet is thinking, and get their beloved pet what they might need or want.

Some of the apps have similar features, however, they mainly focus on the AI part, they can trace the face and come up with a expression, but that's about it, just a tool [4]. It's not very accurate, and you can't do anything after getting the result. And the app is not well designed to store those pictures, which they probably don't have a database for.

I have the share feature or post feature which can let you share your pet's movements every time you take a picture or do an expression check. My method is inspired by all the social apps, but they are mostly focusing on people and stuff, and is a more general app. There are some cool features like, posting after you got an result from the AI, saving your pets and organizing the posts, and in a server that everyone can see it. We believe that every pet lover wants to share

about the fun moments of their pets to someone who really knows about pets, or that is also a pet lover.

After training the AI for a period of time, I introduced the app to my friends. 4 out of 7 of my friends say it is somewhat accurate to their knowledge, and 2 of them thinks the AI is not accurate on their pets. Afterward, 2 sets of 10 tries, and the accuracy was 7/10 and 9/10. the app feature is in general fairly smooth to use. with not a lot of pages, the app isn't complicated and confusing. After some testing from people around me, I received good accuracy feedback on average.

The rest of the paper is organized as follows: Section 2 gives the details on the challenges that we met during the experiment and designing the sample; Section 3 focuses on the details of our solutions corresponding to the challenges that we mentioned in Section 2; Section 4 presents the relevant details about the experiment we did, following by presenting the related work in Section 5. Finally, Section 6 gives the conclusion remarks, as well as pointing out the future work of this project.

2. CHALLENGES

In order to build the project, a few challenges have been identified as follows.

2.1. Using New Language

While using this app, it is my first time using this language, and it is very confusing or frustrating sometimes when you know what you want to write but you don't know what's the word for a function, or you get confused with another language and type a whole lot wrong. But after you get used to it, it would not be as hard anymore since the logic is similar in every language.

2.2. How to design

Another challenging part is how to design, this is my first time doing any app or website, And i found it hard to achieve what i want the pages to look like, It is all very simple and boring shapes the the code can offer, and it takes a long time to create any interesting design i want [5]. It is also a challenge to think of what the users may like.

2.3. Loading speed

The final challenge I faced on this project is it is a big project for the emulator, which I use to test the app on, and it just takes very long to load [6]. I ended up using a real android phone instead by connecting it to my laptop, and it works pretty smoothly with the developer mode. But I also found out it looked a bit different on the real phone compared to the emulator, and that is mainly because of the screen size difference. But this also reminded me of the different sizes of screens so I can make improvements to my design.

3. SOLUTION

The app works like any other social media apps [7]. You have to log in first [8]. You can log in with an email and password. If you don't have an account yet, you can register one with your email, and it will ask you to create a password. Then your account data will be safely stored at Firebase's server. It is all connected so no worry about the account getting stolen. And when you are in the homepage, there will be a post button, which you can post whatever you wanna post,

word, picture, and your result from your AI. And the AI will be in the post page if you need. There will also be a pet's page, which is all about your pet, your page, which is about you [9]. And a navigation bar at the bottom to get you to places fast.. The AI is trained, and the more picture we get from the app post, we will further train the AI more. Which will make it more accurate. overtime. the AI sees the picture and will try to figure out all important points of the picture and compare it with the known-picture and answers to give the final result.
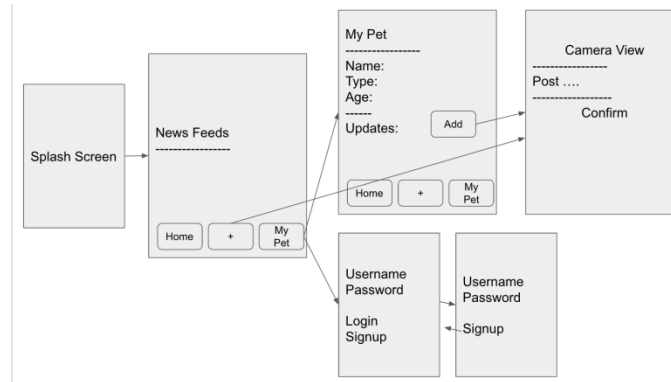

Figure 1. Overview of the solution

```
void LogIntoFireBase() async {
  if(submitLock){
    return;
  }
  submitLock = true;
  try {
    UserCredential userCredential = await
FirebaseAuth.instance.signInWithEmailAndPassword(email: email, password: password);


    //global.user;



    submitLock = false;
    Navigator.pushReplacement(
      context,
      MaterialPageRoute(builder: (context) => HomePage()),
    );
```

Figure 2. Code of Login

This part above is the login page of my app, these specific lines are for whether the login email and password is true or not. It will get the email and password, then it will send it to Firebase, firebase will give an answer back whether it found it or not, if so, the lock will turn false and the user will be let in, if not then it will still be locked to this page.

```
}on FirebaseAuthException catch(e){
  if(e.code == 'user-not-found') {
    popUpInfo("No user found");


  }
  else if(e.code == 'wrong-password') {
  popUpInfo("Wrong password");
  }
  else{
  popUpInfo("Unknown error");
  }
  submitLock = false;


  }
}


void popUpInfo(String message) async{
 ScaffoldMessenger.of(context).removeCurrentSnackBar();
 ScaffoldMessenger.of(context).showSnackBar(SnackBar(content: Text(message)));
}
```

Figure 3. Code of Firebase

This part of code is to let the user know why their login failed. Firebase will receive the email and password, then if it didn't match up with the database, it will send back the reason, and my app will tell the user in a pop up banner about why it failed to login. Is it the username or the password that is incorrect. Or, it might also be unknown if Firebase didn't send anything back.

```
class NavigationBar extends StatelessWidget{

 void navigateToHomePage(BuildContext context){
   Navigator.pushReplacement(
     context,
     MaterialPageRoute(builder: (context) => HomePage()),
   );


 }


 void navigateToPage2(BuildContext context){
    Navigator.pushReplacement(
      context,
     MaterialPageRoute(builder: (context) => Page2()),
   );


 }


 void navigateToUserProfile(BuildContext context){
   Navigator.pushReplacement(
     context,
     MaterialPageRoute(builder: (context) => UserPage()),
   );
```

Figure 4. Code of Navigation Bar

This is the navigation bar, which will be at the bottom of the homepage. it is where the buttons are and where you can click and visit the other pages, the code above it for where the button will send the users to, which is to homepage, user page and post page.

```
bool validForm(){
  if(email.length == 0){
    popUpInfo("Please enter your email.");
    return false;
  }
  if(Nickname.length == 0) {
    popUpInfo("Please enter your Nickname.");
    return false;
  }
  if(password.length == 0){
    popUpInfo("Please enter your password.");
    return false;
  }
  if(password != confirmpassword){
    popUpInfo("Your passwords does not match.");
    return false;
  }
  return true;
}


void popUpInfo(String message) async{
  ScaffoldMessenger.of(context).removeCurrentSnackBar();
  ScaffoldMessenger.of(context).showSnackBar(SnackBar(content: Text(message)));
}
```

Figure 5. Code of registration page

This is the registration page, you have to input an username, an email, and password, and confirm the password. If the password doesn't match, then it won't be able to pass.

```
  _
  } on FirebaseAuthException catch(e){

    if (e.code == 'weak-password') {
      popUpInfo('Error: The password provided is too weak.');
    }
    else if (e.code == 'email-already-in-use') {
      popUpInfo('Error: The account already exists for that email.');
    }
    else if (e.code == 'invalidEmail') {
      popUpInfo('Error: The email provided is too invalid.');
    }
    else{
      popUpInfo('Unknown Error.');
    }

  }

  submitLock = false;
  }
```

Figure 6. Code of Firebase Auth Exception

This part of the code is all the reason why the registration won't pass, it depends on what Firebase gets back to the app. you can't use an already-used email, or an invalid email. And it could fail if your password is too weak.

```
Widget PetPageBody(Map<String, dynamic> petData){
 String uid = FirebaseAuth.instance.currentUser.uid;


  bool isowner = petData["ownerID"] == uid;

  print("Pet Page");
  print(uid);
  print(petData["ownerID"]);
  print(isowner);


  Column c = new Column(
      children: [
        Text('Pet Name: ${petData["name"]}'),
        Text('Birth Year: ${petData["birthYear"]}'),
        Text('Animal Type: ${petData["species"]}'),
        Text('Desc: ${petData["bio"]}'),
        Text("TODO SHOW PET's POSTS"),


        Expanded(child: SingleChildScrollView(child: PetPostList(widget.petID))),


        ElevatedButton(onPressed: (){ navigateToUserProfile(petData["ownerID"]); },
 child: Text("Owner Page")),


      ]
  );
```

Figure 7. Code of profile page

This is in the pet profile page, it is a page where the pet information the user enters before hand will stay, the app will go to Firebase, ask for the pet under the user's id, and print out all the information it have. which includes name, birth year, species and a brief description from the owner, the user can use the pet information to make a quick post when they choose the pet they are posting on the pet post page.

4. EXPERIMENT

4.1. Experiment 1

I tried a couple of pictures to test the AI's accuracy. I have 10 different pictures, and I see that it gets the same result every time. The ideal result is every set I try, every picture comes back with the same result, which proves that the machine isn't guessing but really identifying it.

Try	Results
1	happy
2	happy
3	happy
4	happy
5	happy
6	scared
7	scared
8	happy
9	angry
10	happy

Figure 8. Result of experiment 1

The result came back decently, 7 out of 10 pictures in every set came back the same, which is good enough for a new AI machine, because it will come better with more training.

4.2. Experiment 2

The second experiment I did is I introduced my code to a couple of people around me, and I let them taste their own pictures of their pet, and compare it to what they think their pet's emotion is in their own opinion.

people	result	expectation	feedback
1	sad	depressed	positive
2	sad	boring	positive
3	happy	nothing	positive
4	happy	angry	negative
5	angry	scared	positive
6	sad	happy	negative
7	happy	cozy	---

Figure 9. Result of experiment 2

4 out of 7 friends gave me positive feedback on the AI machine, and 2 came back negative, which means I can still work on and train my AI better later on.

The AI machine meets my expectations. , and from the feedback, i made some improvements on it. My expectation is it is a stable AI, which it did decently in, and it is at least 50% right on the determination of the result.

5. RELATED WORK

Happy pets is an app available in the app store, it's focus is on the AI part, it can find out the animal, the breed, the emotion from a picture [11]. and it also has a description of every breed of cats and dogs built in. Mine is different in a way that my AI is not capable of finding some of the stats like "happy pets" does, but i have a social feature.

Pettitude is an app available in the app store, it's only focuses on the emotion on the pet, and that's also the only feature of it [12]. Comparing to mine, it has the similar AI feature, but without the social feature that my app is including. and doesn't store any data as well. But it doesn't require internet to use.

My friend has an app that could tell the bark of a dog [13]. It is similar in some ways to the AI, but in general, it is for a different use than mine. Mine is for social and his is for security. But the AI both plays a significant role in the app.

6. CONCLUSIONS

I have created a app that is dedicated to pets and pet owners to share their story and with the tools to make it fun, such as AI [14]. The app is meant to share your pet and spread happiness among people, and ask questions for people who have the same hobby or interest as you. The app contains every essential thing for a social app. And we store information on Firebase. It requires a login to use, and people can input their pet's information on their pet page. The AI is another thing important to this app. The AI is fairly accurate and will get better as more pictures and comments are stored by the app. It can read the picture and give an estimated result of the emotion of the pet from its facial expression [15]. The experiment results show it is in a good stage. A high percentage of people said it was accurate. And it is very stable. Which is important. So I would say it is solving the question I had at first place-" I want to know what my pet is thinking and share it to other pet lovers".

Even though it is evolving, the accuracy is still far from scientifically accurate. The app it sells could also look better and perform better with more advanced codes. And I can improve the controls and looks of the app after customer's surveys or likes.

I will create an AI from the start, and try to train it to my best. I can read multiple kinds of animals clearly. It can be more accurate. And i will ask or search more on designing, and improve my overall app quality.

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