

Real-Time Emotion Detection With CNN

An A.i system which can easily analyse an individuals current emotional state through their facial expression.

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Context of use: Education
Level of education: Bachelor

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Impact on society

What impact is expected from your technology?

What is exactly the problem? Is it really a problem? Are you sure?

Problem: From research, According to Kara-Yakoubian, M. (2022, January 17), found that mental health problems due to loneliness have been on the rise. When individuals lack supportive companions during emotional challenges, their mental health declines.

The problem I am trying to address is the aspect of lacking a support system.

Are you sure that this technology is solving the RIGHT problem?

Yes I am very sure

How is this technology going to solve the problem?

The purpose of this technology is to create an AI system that can identify a person's emotions. This system can then be integrated into another system where the AI recognizes when someone is sad and initiates an action like playing comforting music or adjusting the house temperature to make them more comfortable. This way, the AI is able to support the user and show them that their emotions are being acknowledged.

What negative effects do you expect from this technology?

Some negative concerns I can imagine are:

- Privacy concerns: due to the A.i accessing images of people's faces, there could be a future issue with the people's faces which the AI has been trained on not wanting themselves being in the technology any longer
- Misinterpretation of emotions: due to the technology being an A.i there is always going to be a margin of error, therefore the chance of the A.i being inaccurate with its prediction is possible.
- Emotional manipulation: the technology could be used by commercial companies as a way to market their product by exploiting the knowledge of how a user is feeling through faking the A.i prediction ability.

In what way is this technology contributing to a world you want to live in?

The technology is contributing to the world I would live in by:

- Encouraging empathy and emotional intelligence in the world,

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- Enhancing the overall well-being of use by giving them the feeling of being seen, valued and understood.
- Using A.I. to monitor emotions can help individuals improve their awareness of their own feelings, leading to a better understanding of their emotions.

Now that you have thought hard about the impact of this technology on society (by filling out the questions above), what improvements would you like to make to the technology? List them below.

Things I will take into account after this assessment are:

- I have to ensure all the data for training the A.i is legally collected
- I will ensure the A.i accuracy and bias levels are at a very good metric and further explain to its users the system is not to be fully trusted 100%.

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Hateful and criminal actors

What can bad actors do with your technology?

In which way can the technology be used to break the law or avoid the consequences of breaking the law?

A criminal actor could hack the technology and therefore access a customer's current emotions, which could therefore lead the criminal actor to influence the customer in engaging in dangerous acts.

As an example, consider a hacker breaches into our client Bob's home expression detection A.i and discovers Bob is feeling sad at that moment. The hacker could then bombard Bob with a lot of messages and tweets which could further enhance Bob's unhappiness. This could potentially lead to Bob engaging in extreme activities.

Can fakers, thieves or scammers abuse the technology?

In a situation where a hacker hacks the system and then sees our customer is in a sad state, the hacker could further use this as an opportunity to spam our clients with more information to harass them.

Can the technology be used against certain (ethnic) groups or (social) classes?

Yes, it can be used against ethnic groups and genders. This is due to the system being related to facial recognition. Therefore if the system is not trained on every ethnic group or gender, it will not accurately read the person's emotions.

In which way can bad actors use this technology to pit certain groups against each other? These groups can be, but are not constrained to, ethnic, social, political or religious groups.

Not applicable to my technology

How could bad actors use this technology to subvert or attack the truth?

The AI, due to its lack of complete reliability, might spread emotional misinformation. For example, if the AI wrongly detects that the user is angry and repeatedly attempts to make the customer less angry, it could end up being a nuisance and annoying the customer instead.

Now that you have thought hard about how bad actors can impact this technology, what improvements would you like to make? List them

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below.

- Ensuring the A.i has a balanced dataset of all races and gender for training.
- Ensuring the A.i, if deployed to the public, has adequate security measures. Additionally on the hosting system implementing a precaution that deactivates the A.i predictions in the presence of detected threats.

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Privacy

Are you considering the privacy & personal data of the users of your technology?

Does the technology register personal data? If yes, what personal data?

Yes, the A.i system does take notice of what ethnicity the customer is and their face.

Do you think the technology invades the privacy of the stakeholders? If yes, in what way?

Yes, due to the A.i needing to consistently be on, to notice the changes in the customer expression. This can make the customer have a sense of being watched at the first few months of having the A.i.

Is the technology is compliant with prevailing privacy and data protection law? Can you indicate why?

Yes, the technology is compliant.

The A.i system is only trained on data it solely requires which is people's faces, therefore the A.i is designed in such a way that it will only notice the customer's facial expression.

Does the technology mitigate privacy and data protection risks/concerns (privacy by design)? Please indicate how.

Yes, the A.i will be trained to only notice people's faces so it only registers or has data on this.

In which way can you imagine a future impact of the collection of personal data?

Yes, the A.i due to predicting the customer's emotions creates data that can follow them throughout their lifetimes.

Now that you have thought hard about privacy and data protection, what improvements would you like to make? List them below.

There are no improvements to be made on this topic.

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Human values

How does the technology affect your human values?

How is the identity of the (intended) users affected by the technology?

There could be a situation if the AI predicts a customer is sad a number of times when people are around the customer, they might begin to think the customer is always sad

How does the technology influence the users' autonomy?

Yes, users are allowed to make their own decisions based on the AI. The AI job is only to predict/classify what a customer's current emotional state is based on facial expression, the customer has full autonomy to decide what they do with this information.

What is the effect of the technology on the health and/or well-being of users?

There is a chance the customer might not seek out human interaction since they get the satisfaction that they are being seen already but in this case by the AI.

Now that you have thought hard about the impact of your technology on human values, what improvements would you like to make to the technology? List them below.

No improvements can be made based on this category

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Stakeholders

Have you considered all stakeholders?

This category is only partial filled.

Who are the main users/targetgroups/stakeholders for this technology? Think about the intended context by answering these questions.

Name of the stakeholder

Individuals who feel lonely at home

How is this stakeholder affected?

It will help

Did you consult the stakeholder?

Yes

Are you going to take this stakeholder into account?

Yes

Did you consider all stakeholders, even the ones that might not be a user or target group, but still might be of interest?

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Now that you have thought hard about all stakeholders, what improvements would you like to make? List them below.

This question has not been answered yet.

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Data

Is data in your technology properly used?

Are you familiar with the fundamental shortcomings and pitfalls of data and do you take this sufficiently into account in the technology?

Yes, I am familiar with this and I do take the shortcomings into account while training the A.I

My data preparation process involves

- Balancing the images based on ethnicity and race

Additionally training the AI on a pre-trained model so the AI is more robust and doesn't suffer from the lack of adequate data.

How does the technology organize continuous improvement when it comes to the use of data?

Yes feedback on the kind of data I am using has been discussed with my technical coach, therefore ensuring I have an expert feedback on the topic.

How will the technology keep the insights that it identifies with data sustainable over time?

The data used for the AI are based on images of facial expressions, therefore I do not think it has any problem with sustainability over time, this is also due to human facial expressions not changing as time flies. An expression that signifies disgust is always going to remain the same.

In what way do you consider the fact that data is collected from the users?

Not applicable, due to me not selling the product or making a profit from it.

Now that you have thought hard about the impact of data on this technology, what improvements would you like to make? List them below.

No improvement to be made on this topic

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Inclusivity

Is your technology fair for everyone?

Will everyone have access to the technology?

Yes everyone will have access to the technology

Does this technology have a built-in bias?

Yes, the technology could potentially have a built-in bias if I can not source data for all ethnicities or for all emotional expressions. It could become the case the technology doesn't detect a certain emotion well or a certain ethnic emotion.

Does this technology make automatic decisions and how do you account for them?

Yes these decisions can be explained through the use of GradCam. This system will go into the AI vision model to find out what the AI basis its decisions on.

Is everyone benefitting from the technology or only a a small group?

Do you see this as a problem? Why/why not?

Yes everyone can benefit from the technology.

No, I do not see this as a problem this is due to the main goal of the technology is to provide support to people undergoing mental health problems due to loneliness, therefore if the technology can effectively address this for a large audience that would amazing.

Does the team that creates the technology represent the diversity of our society?

Not applicable, since this is an individual project.

Now that you have thought hard about the inclusivity of the technology, what improvements would you like to make? List them below.

No improvements to be made

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Transparency

Are you transparent about how your technology works?

Is it explained to the users/stakeholders how the technology works and how the business model works?

Yes, it is easy to understand how the technology works due to the use of another system called GradCam which help in explaining what a vision AI is looking at when making its predictions.

If the technology makes an (algorithmic) decision, is it explained to the users/stakeholders how the decision was reached?

Yes, in the development report of the technology, there will be a full explanation of the kind of data, how the AI make its predictions and what cannot be explained.

Is it possible to file a complaint or ask questions/get answers about this technology?

If in this case, the users(testers) are my teachers questions can be directed to me the developer during the testing process.

Is the technology (company) clear about possible negative consequences or shortcomings of the technology?

Yes, in the conclusion of the report, it will be stated to not fully trust the predictions of the AI

Now that you have thought hard about the transparency of this technology, what improvements would you like to make? List them below.

No improvements to be made

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Sustainability

Is your technology environmentally sustainable?

This category is not applicable for this technology.

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Future

Did you consider future impact?

What could possibly happen with this technology in the future?

An increase in the emotional well-being of people. If the technology is fully developed, there is a chance if used by customers there would be a decrease in individuals who feel lonely and not heard.

Sketch a or some future scenario (s) (20-50 years up front) regarding the technology with the help of storytelling. Start with at least one utopian scenario.

In a utopian society,

Bob (our customer) comes back home a bit upset, the AI notices this and based on this prediction initiates calming lights and music so that Bob's mood can change to neutral.

In the future, my technology has transformed Bob's life by acting as a supportive partner.

Sketch a or some future scenario (s) (20-50 years up front) regarding the technology with the help of storytelling. Start with at least one dystopian scenario.

In a dystopian society,

The government has in some way hacked Bob's home system and monitored his emotions. They have noticed Bob is almost always angry every day and decided he is a threat to society, therefore putting him on a watch list or worse insisting he goes to a mental asylum.

In the future, my technology has become a tool for oppression and control.

Would you like to live in one of this scenario's? Why? Why not?

Yes, I would like to live in the utopian society described. This is due to even as the developer sometimes going through moments where I do not feel seen or heard, therefore the AI would be a good supportive partner in those moments.

What happens if the technology (which you have thought of as ethically well-considered) is bought or taken over by another party?

Not applicable to my current situation being that it is a school project.

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Impact Improvement: Now that you have thought hard about the future impact of the technology, what improvements would you like to make? List them below.

No improvement to be made.