Essay Format (Your own resume must be attached) (1/3)

JAF Number	2 - R&D Engineer - Voice User Interface

General Information

Name	Sachin Goyal
Date of Birth	2nd May 1997
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Gender	Male

Education Information

University	IIT-Bombay
Department	Electrical Engineering
Diploma	B-Tech(Bachelor)
We had explained during the Campus Talk our expectation of hiring long-term employees(at least 5 years). What are your future career aspirations and how do you think they align with Sony's requirement?	I aspire to lead a research group working on consumer centric problems with use of latest technologies like deep learning and machine learning. I feel that there's a lot to be done in terms of corrupted audio processing. This, I believe is of practical importance as well since the real world applications have an intrinsic noise element which corrupts the audio signal. Settling at Sony for a long period (at least 7 to 8 years) seems the best path to realise my dreams as Sony is known for driving innovation as well as serving consumers with moving and more engaging experiences. Also sony is one of the leader firms in terms of work in audio processing.

Essay Questions

1. Please describe your technological strength/expertise which you think would be suitable for the position you are applying for, and how you can contribute to Sony. (Less than 500 words)

In the past 3 years at IIT Bombay, I have explored areas of **signal processing**, image processing and computer vision focusing on combining the classical approaches for the problems with modern approaches using deep neural networks. I am mainly intrigued by the **statistical and mathematical aspects** of signals especially speech, images and graphics. My research approach has always been to focus on the current bottleneck in the classical solutions and use modern tools of machine learning to overcome those challenges. Like many a times, classical approaches have numerous parameters difficult to ascertain for realistic modelling and hence the results are derived assuming ideal conditions. But with machine learning, one can thrive to better estimate these parameters based on sample data correlations.

Audio processing fascinates me since we take into account the specific structure of speech or music signals which leads us to consider interesting priors. This, in turn, motivates me to think of and develop sophisticated signal processing algorithms tailored for audio signals.
Previously, I have worked on using **LSTMs** for Indoor Positioning system to help locate and track objects inside a building or closed rooms where GPS can not be used due to its low accuracy. Our model consisted of a central router which sends wifi signals to 4 receivers and 1 to be tracked object in the surrounding. We proposed a **Time Series Analysis** of received signal strengths using **LSTMs** to estimate the distance of object from the central router. The model achieved state of the art results with an **accuracy of 5.85cm** with 93% confidence interval. My work specifically involved developing a LSTM network suitable for our task and to research upon various path loss models for signal attenuation in environment. (**Paper** submitted to **International Conference on Communications 2019, Shanghai** -> Pranav Sankhe, Saqib Azim, **Sachin Goyal**, Tanya Choudhary, Kumar Appaiah, Sukumar Srikant "Indoor Positioning System using LSTMs over WLAN Network").

In Summers 2018, I interned at Qualcomm, Hyderabad working in the **Multimedia Development Team**. I worked in integrating the car infotainment system with Qualcomm snapdragon precisely working on developing a framework for audio (driver voice) transmission from car dashboard microphones to the mobile using **RTP** backend. The project also involved development of a **command engine** to recognise the commands from received signal and integrate it to the android framework hence enabling complete control of driver mobile using voice.
Previous to this, in summers 2017, I have worked as a research scholar under Prof Jerry Prince of **Johns Hopkins University**, where I developed novel algorithms for **super resolution** of MRI images using **anchored neighbourhood regressions** and Fourier accumulation (**Paper** -> **Sachin Goyal**, Can Zhao, Amod Jog, Jerry L. Prince, Aaron Carass "Improving Self Super Resolution in Magnetic Resonance Images" **SPIE Conference on Medical Imaging** and Biomedical Applications 2018, **Houston, Texas**)

Deep learning has always excited me by its sheer strength of estimating functions precisely and the kind of results it has given in various domains ranging from biomedical imaging to computer vision to Natural Language Processing. Currently I am working with Prof. Subhashish Choudhary on pose estimation and **detecting symmetrical priors** in images with the aim to use it for better 3D reconstructions of scenes from images. Apart from these, I have also worked on **Zero Shot learning** to predict labels of classes unseen during the training phase. I got to know about mapping features from 2 different spaces (animal names and animal images) to a common space using **word2vec** and VGG based model. The model implemented achieved an accuracy of 65.3% on classes unseen during training phase.

Skills I gained by working on these projects have been sharpened by the relevant courses I took like **digital signal processing**, machine learning, computer vision, image processing and computer graphics. My knowledge in signal processing and **time series deep networks** from courses taken coupled with the experience of related projects makes me suitable for the voice user interface research profile as per the requirements and description mentioned in the JAF. I will also be willing to contribute to new emerging teams or research projects and take up challenging work in other related fields.

2. Please describe your understanding towards Japan. What can you imagine as difficulty to be working in a foreign country with different culture and people? And how do you overcome them?(Less than 500 words)

I have always seen Japan as a country sitting at the zenith of technological development, actively driving the innovation in science. Japan has an unmatched contribution in the fields of robotics, computer science, games and anime. As a matter of fact, I have always been motivated to pursue research and development in Japan seeing amazing works like **ASIMO**, **AIBO** and **QRIO** all of which have come from Japanese firms. Japan has a great culture too, rich with **mythology, arts and ancient architecture**. I have always been fascinated by things ranging from superb anime films, Manga, beyblades and Pokemons to the desire of riding bullet trains and witnessing an excellent infrastructure despite the natural challenges.

It is always very fascinating to hear about the excellent work culture, **team spirit** and **integrity** found in the Japanese companies making me eager enough to work in a similar environment. I am specially attracted by the fact that Japanese firms give special attention to **minute details** and everyone in the firm acts in **harmony** to succeed.
It has always been great to hear about the **patriotism** and **discipline** followed by Japanese people. Living and working in such a environment would definitely give me an unmatched opportunity for **personality development** apart from a steep learning curve and opportunities to be a part of developing next disruptive technology.

Infact, I would like to share that my primary school's logo was **"Kaizen - Quest for continuous improvement "** taken from the Japanese philosophy. I have also read about Sony's root philosophy of **KANDO**, aimed to deliver moving experiences to Sony consumers by **driving innovation and challenge**.

As an individual, I love taking up challenges, after all what else can be a better way to build memories in a lifetime. Working in Japan, would surely confront me with some initial challenges related to culture and language but that is exactly one of my **major motivations** to apply for job at Sony Japan, since it at the same time opens up new frontiers for self development and **cultural leaning**. **Difficulties exist till the time they are perceived as one**.

India as such is a land of diversity with highly diverse languages as one goes from north to the south. There are people from all over India at IIT Bombay. Working in projects and teams with students from diverse backgrounds has been a great pleasure and a learning opportunity. In summers 2018, I lived in Hyderabad, which has a whole together different culture and language but I was able to make new friends and adopt to the new place easily. Previous to this, I was a research scholar in USA and was confronted with new challenges in a foreign country. It was a great experience to enjoy a new eating cuisine. As a person, I have loved adventure and travel a lot. I think, all of my previous experiences of travelling and living in different areas have helped me to come out as a better and more independent individual, helping me to appreciate diversity and cultural differences.

I like to travel and explore new cuisines and it would be surely great to experience Japanese cuisine including sushi and ramen. Initially, language preferences in Japan may seem to be a trouble, but I am confident enough that I can **adopt** easily also assisted by the fact as told in Pre Placement talk that we would be **given a 2 months training** before departure for Japan. Hence I am **looking forward confidently** to the experience Sony Japan has to offer.

3. Please describe what you want to achieve in the future, and expect to gain from working in Sony, from the position you are applying. (Less than 500 words)

Leaving a mark on the way humanity develops by working on **disruptive technologies** is basically what I want to achieve in future. I see myself as head of a research group in a multi national firm working on fundamental problems in domains of speech and computer vision. I have always dreamt of **seeding** a few research groups working on expanding fundamental domains in various fields by identifying current bottle necks in the classical approaches, substituting them with new tools like machine learning. One of the ideas on which I am currently exploring is to implement style transfer on audio(inspired by the recent magnificent papers on style transfer on images).

I have always been an ambitious person looking for challenging work projects which require one to apply knowledge from multiple domains. I think that Sony is the perfect path for me to achieve my goals because of the kind of consumer centric innovation Sony is known for. Working with Sony voice and natural language team will definitely give me an opportunity to know about the latest cutting edge technologies in the same domains. I hope to learn what exactly is involved in converting a research lab innovation or technology to a commercial product in an MNC. Working with Sony will surely help me to broaden my approach to solving problems and learning how to think of innovative solutions which are practically realisable and commercially viable. Sony seems the best for this because of its **motto** of serving the customers with **5 core principles** of curiosity, empathy, integrity, ambition and vision.

Apart from technical aspect, I believe that working at a MNC like Sony with people from all over the world would enable me to come up as a better team player and give me opportunity to learn multiple cultures at a one single place. Last but not the least, I wish to explore and live in Japan as a whole. It is obviously a major technology hub, a **temple** and an **abode of learning** for budding engineers.