Business Case:

Sun Life Financial is moving towards building assurance for the use of appropriate safety equipment to enable clients to reduce the number of insurance claims. With the use of AWS DeepLens, our task pilot this initiative by developing an AI system and a reporting dashboard, it will detect and report appropriate usage of Personal Protective Equipment (PPE) in the workplace.

In Sun Life's 2019 Annual Report, Bill D. Anderson (Chairman of the Board) commented on the progress of Sun Life's digital journey. He stated: "[Sun Life] continued to make it easier for clients to do business with us in all of our markets, using technology and data to be more personal, predictive, and proactive." Our project aims to demonstrate the art of the possible when using AWS DeepLens technology to achieve personal, predictive, and proactive workplace risk assessments relating to disability claims. This new capability aims to enhance Client experience through injury prevention and to offer discounted premiums to companies demonstrating necessary safety compliance.

Traditionally, one-third of Sun Life's disability claims have been made by industries that require the use of Personal Protective Equipment (PPE), such as hard hats, construction boots, safety vests, etc. PPEs are essential and legally required in many industries. They can reduce the risks of wearers from workplace injuries. Therefore, it is crucial to ensure those companies insuring through Sun Life comply with the safety standards. We would like to propose using the AWS DeepLens tool, a video camera technology that combines Artificial Intelligence and surveillance monitoring all into one device. The goal is three-fold: First, to ensure safety standards to reduce the number of workers' injuries occurring. For example, if the camera detects a worker on a construction site without proper PPE. The construction site manager will receive a notification and remind the worker to put on his/her adequate gear. Second, this new technology will allow Sun Life to offer tiered insurance premium pricing. This will give Sun Life a more competitive pricing advantage over other insurance rivals. Companies that apply AWS DeepLens or similar technology will benefit from more favorable pricing, which encourages companies to achieve better safety standards. Third, AWS DeepLens can help improve the internal process of disability claims management and enable the company for a more proactive underwriting approach using data collected through the DeepLens. AWS Deeplens can be integrated as part of Sun Life's existing AWS frameworks and produce risk assessment reports that would help identify potential cases that could pose a risk to the organization while simultaneously optimize costs for Sun Life.

Project Objective / Success Criteria:

The definition of success is to develop a Proof of Concept (POC) that demonstrates tangible and beneficial results for Sun Life to consider adopting AWS DeepLens technology to build its pricing strategy. We will be the product owners of this pilot meant to detect one item of Personal Protective Equipment (PPE) in addition to helmet recognition on construction sites. End-to-end development and deployment considerations must be fully documented to prove or disprove the feasibility of a full-scale production deployment. Following are the success measurement criteria:

- Ability to detect one or two PPE (face mask, hard hat, one more of our choice)
- Facial recognition of functional implementation
- Dashboard – for claim investigators, pricing analyst, and under-writers
- Final Presentation – to Sun Life.

Stakeholders List:

- **SMITH SCHOOL OF BUSINESS**
  - Professor Mikhail Nediak (mikhail.nediak@queensu.ca)
  - A Victoria Scott (vs56@queensu.ca)
- **SUN LIFE**
  - Phoenix Unnayan Majumder
  - Kien Ly

Project Approvals:

- Professor Mikhail Nediak
- Phoenix Unnayan Majumder
- Kien Ly

List of Deliverables:

- Build and deploy an AI model to detect PPE on a construction worker at the site:
  - The worker is wearing a helmet (hard hat)
  - The worker is wearing a PPE other than a hard hat
  - Facial recognition – for identifying the defaulter
- Create a dashboard listing some construction companies. Example of some potential fields – number of employees insured, no. of violations, AI to advise an increase in premium for high-risk companies with the increasing violation, probability of exposure. This dashboard will be in parallel to the model development. The data for this dashboard will be generated through prepared Monte Carlo/Bootstrapping or a similar simulation technique to generate a realistic dataset to prove the concept. A template will be created using an excel spreadsheet first, presented to Sun Life. Dashboard creation will begin after receiving the sign off from Sun Life.
- Data Annotation: Leverage pre-trained models. Also, collect images and annotate them manually (1500 - 2000).
- Final Project Report.
- PowerPoint presentation (Product Pitch) (this will include the project details, ethics consideration, and next steps)

Project Assumptions:

- The dashboard will contain generated data through simulation
- Images are downloaded from the internet and annotated manually.
- This POC is only targeting Construction site
- Sun Life to provide one AWS DeepLens camera and PPE
- AWS to give credits for the platform usage
- 6 MMAI students will work on this project
- SME from Sunlife will be available for any technical help
- Only utilize AWS Platform for implementation
- Every task estimate will consider learning curve involved for adapting the AWS platform

Project Dependencies:

- AWS Student account setup and/or AWS Credits
- Deep Lens device for integration testing
- SunLife to provide some analytics data to support the business need of the project.

Overall Project Risk:

- Limited training and testing data may lead to overfitting.
- Due to the unavailability of the actual data from the construction site, Model Performance cannot be guaranteed.
- Lack of stakeholder buy-in (disapproving parties may air their frustration on public forums)
- Scheduling risks (tasks may take longer to accomplish than initially planned**)**
- Availability of AWS DeepLens cameras
- Privacy concerns (stakeholders may or may not be comfortable with a third-party surveillance tool)
- AWS platform is new to the students, and they are learning about the platform through external resources.

Summary of Milestone Dates:

Task	**Completion Date**	**Lead**	**Second**
Initial Setup	6/15	Carol	Team
Data Preparation and Annotation	6/19	Carol	Team
Create and Train Model	7/10	Nayef	Carol, Ruchika, Diana
Evaluate Model	7/17	Nayef	Carol, Ruchika, Janki, Diana
Error Analysis	7/31	Diana	Carol/Nayef
Model Tuning	7/31	Diana	Carol/Nayef
Deploy Model	7/31	Joy	Carol/Nayef, Ruchika, Diana
Push Notification	7/31	Joy	Carol/Nayef, Ruchika
Dashboard	08/31	Ruchika	Joy, Diana, Carol, Janki
Final Paper	08/31	Ruchika	Team
Presentation	08/31	Janki	Team

Roles & Responsibilities of the team members:

Team Member Name	Role and Responsibility
Ruchika Julka	Lead the Dashboard and Final Reporting, will work on Model Creation/Evaluation, responsible for project management activities (maintaining WBS) and will help wherever needed.
Diana Moyano	Lead the error analysis and model tuning, also help in building the dashboard. Also, will help wherever needed.
Carol Guo	Lead the data set up and helping the team in every stage of the project.
Janki Desai	Lead the final presentation, also help in model Evaluation, dashboard creation and will help wherever needed.
Joy Hopper	Lead the Model Deployment and Push Notifications and will help wherever needed.
Nayef Abou Tayoun	Lead the building and training models and will help wherever needed.

Out of Scope

- Use of dataset from Sun Life
- Manual Annotation of over 2000 images for the POC
- More than two working PPE

Communication Strategy

- Communication Mode: Smith's email and Zoom Calls
- Project team meetings: Weekly
- Meetings with Sun Life SMEs: Weekly or bi-weekly based on questions or blocker team may face during the project implementation.
- Status reports to Sun Life: WBS will be shared Bi-weekly
- Announcements to Sun Life: As needed via email