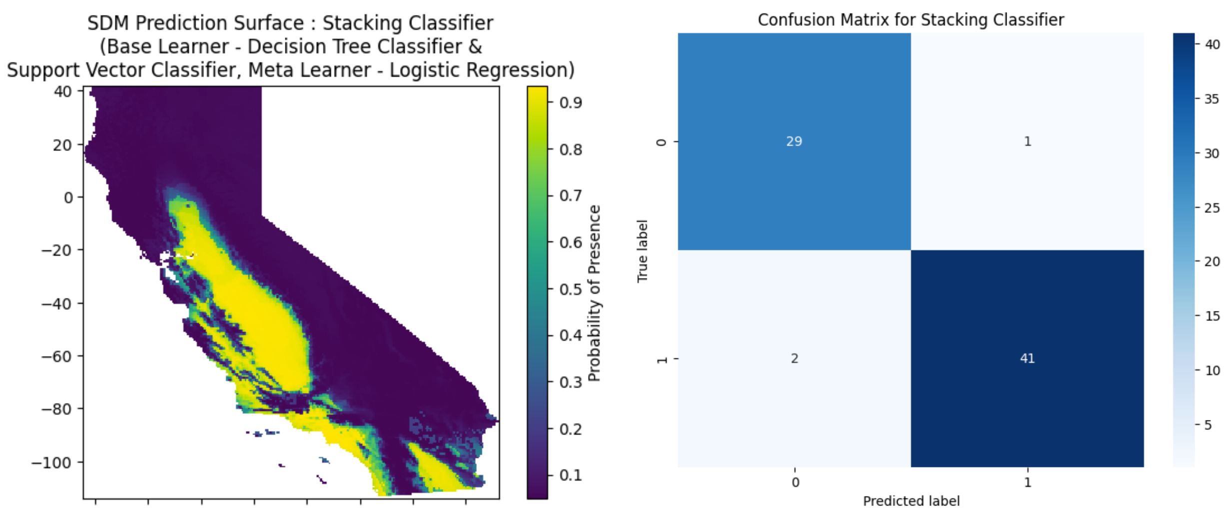
Results Report

Carrots rarified pseudo absence data with Isolation Forest – Standard Scaling

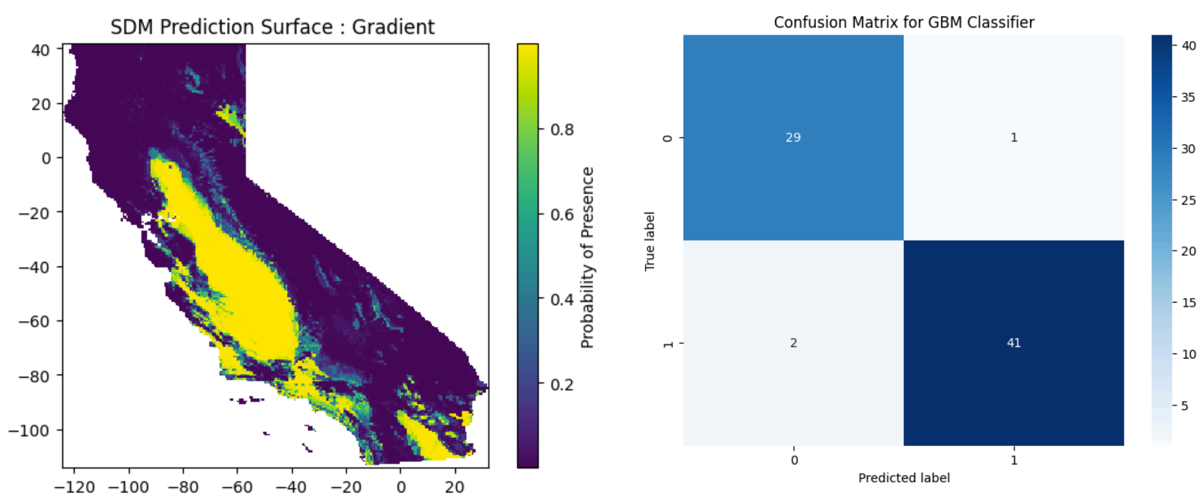
Carrots Rarified Points - Activation Map & Confusion Matrix

Presence Distribution – `presence (1) 242, pseudo absence (0):` 242

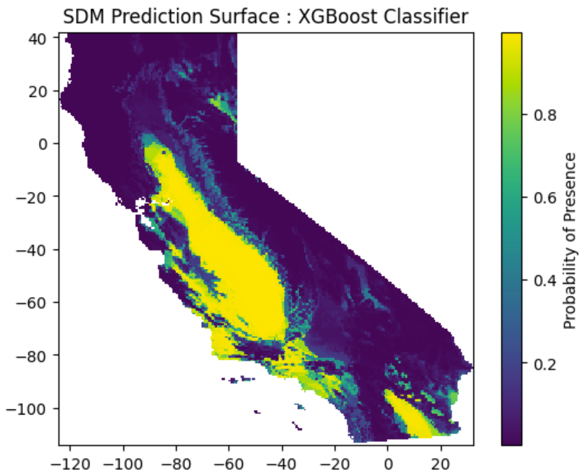
1. Ensemble Model – Stacking Classifier

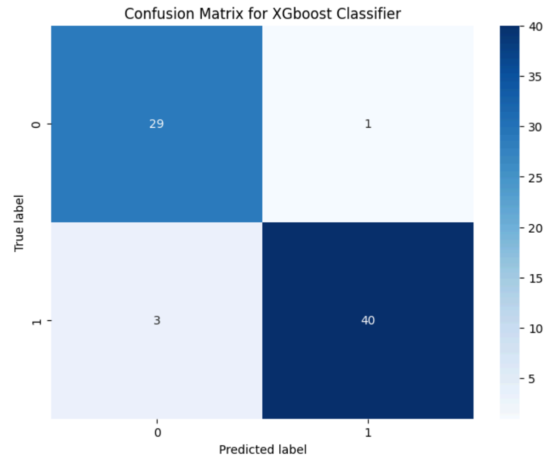


2. Ensemble Model – Gradient Boosting Classifier

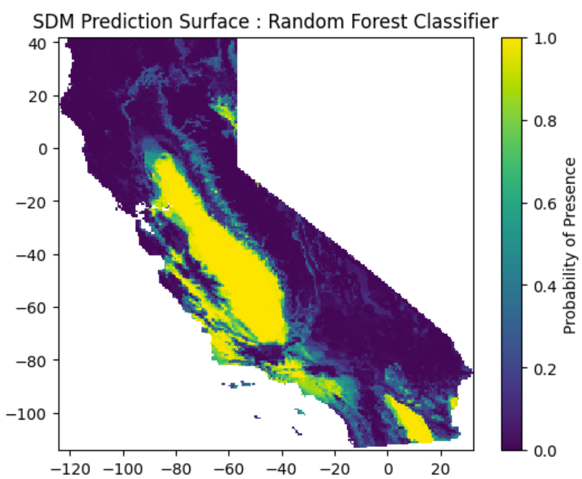


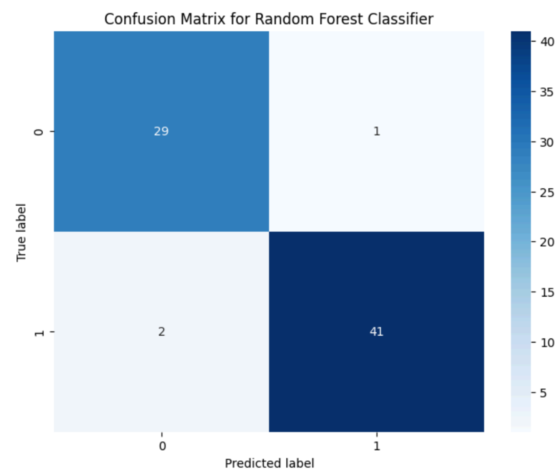
3. Ensemble Model – XGBoost Classifier



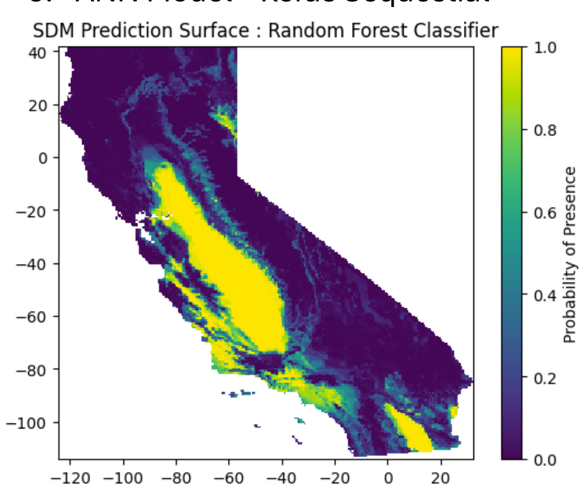


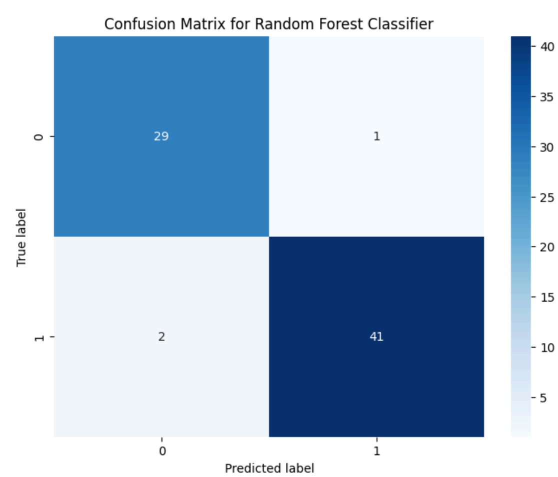
4. Ensemble Model – Random Forest



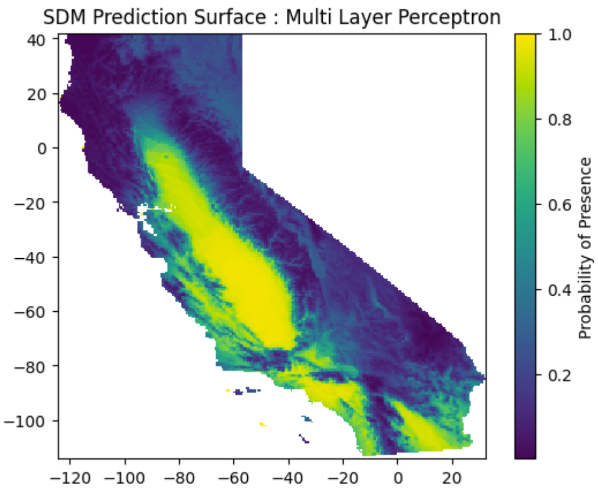


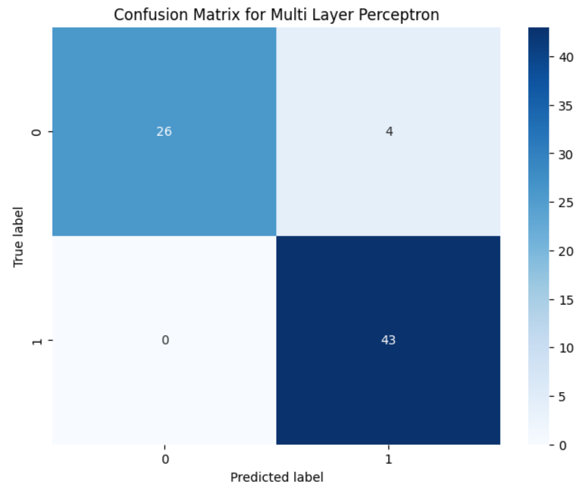
5. ANN Model – Keras Sequestial



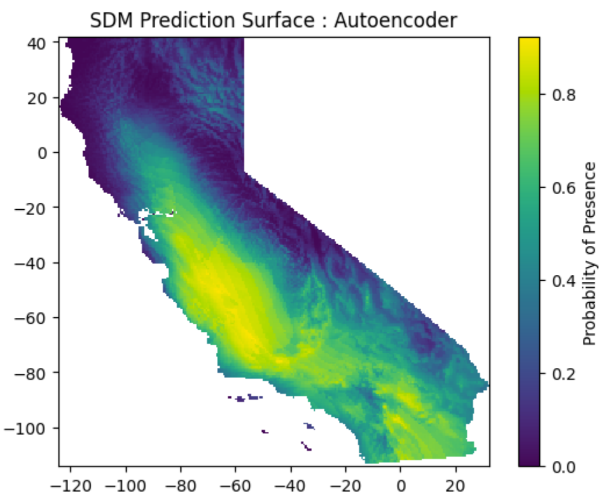


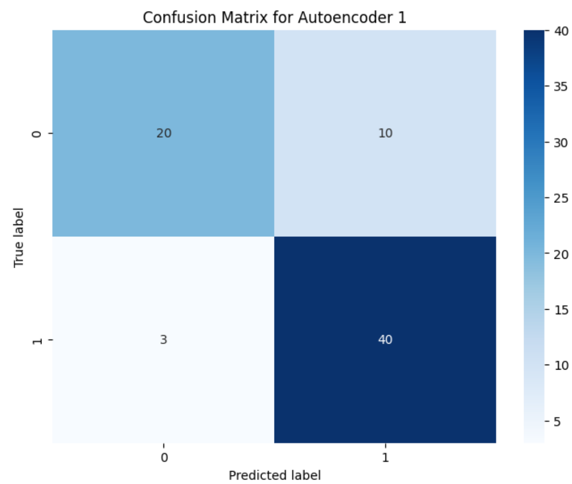
6. ANN Model – Multi Layer Perceptron



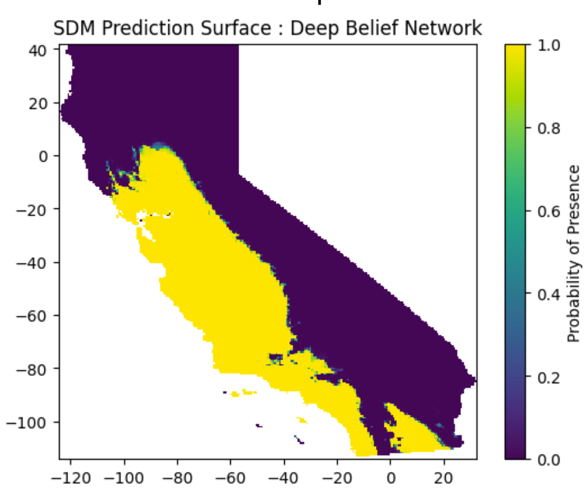


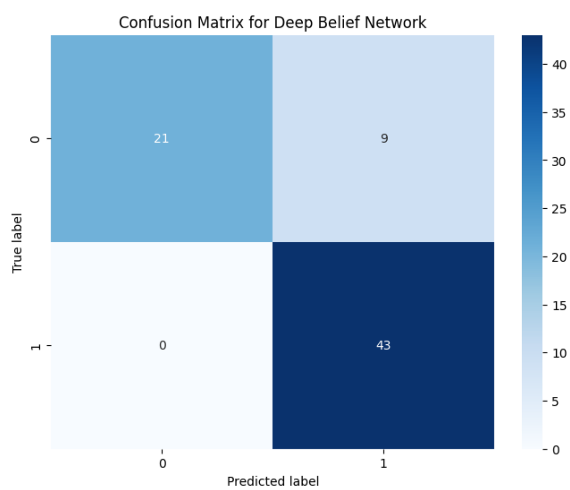
7. ANN Model – Autoencoder



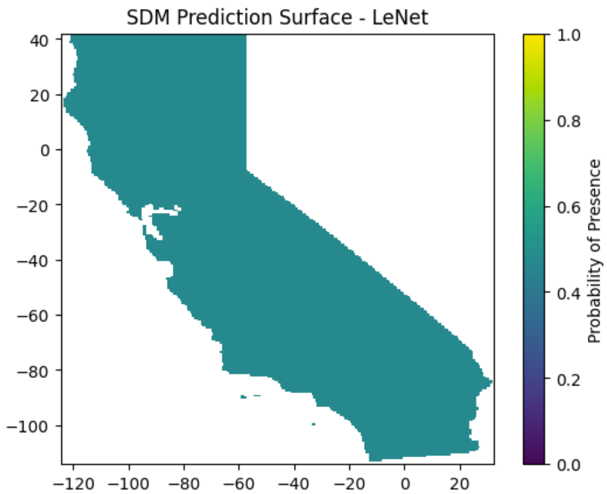


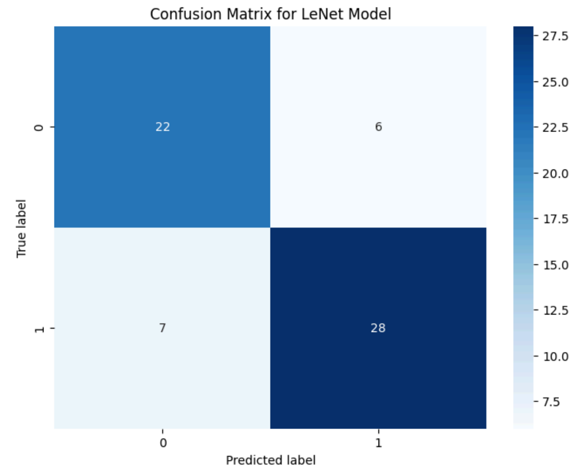
8. ANN Model – Deep Belief Network



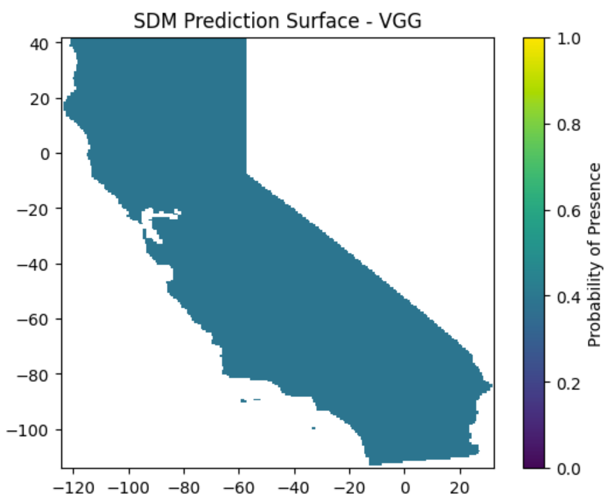


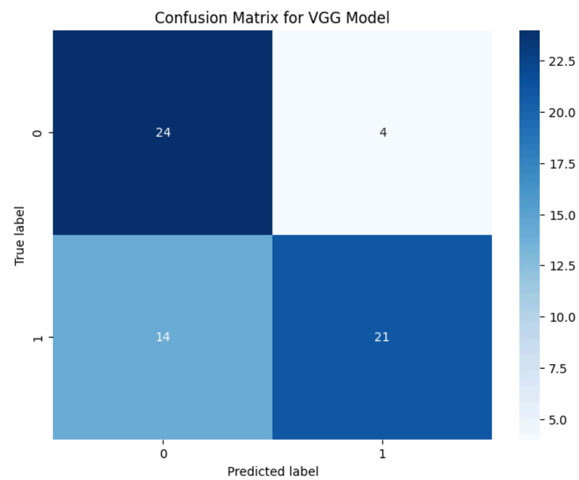
9. CNN Model – LeNet5 Model



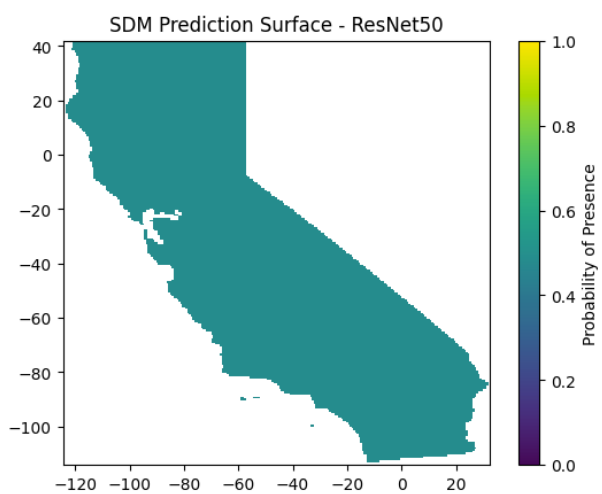


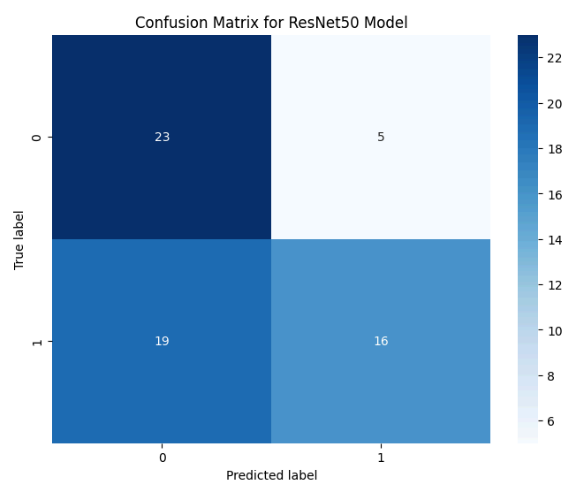
10. CNN Model – Visual Geometry Group



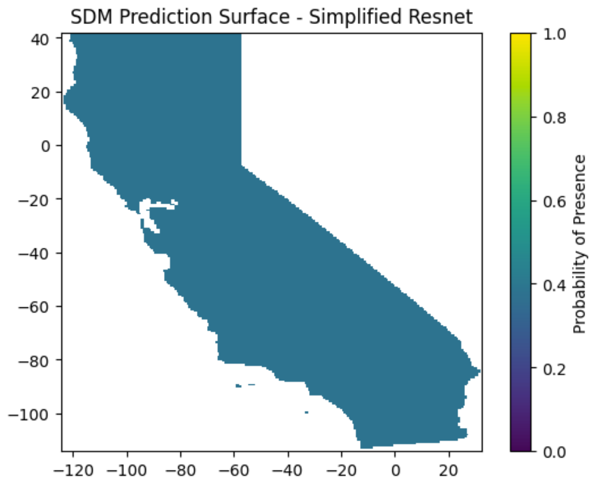


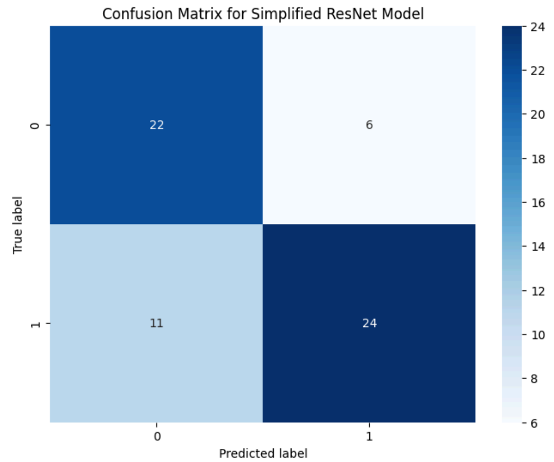
11. CNN Model – ResNet50



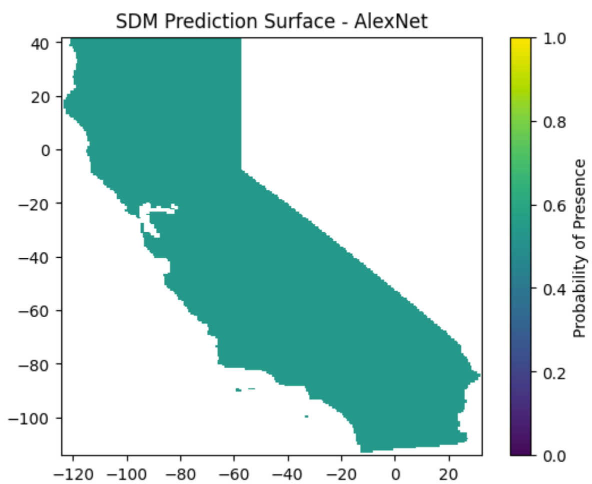


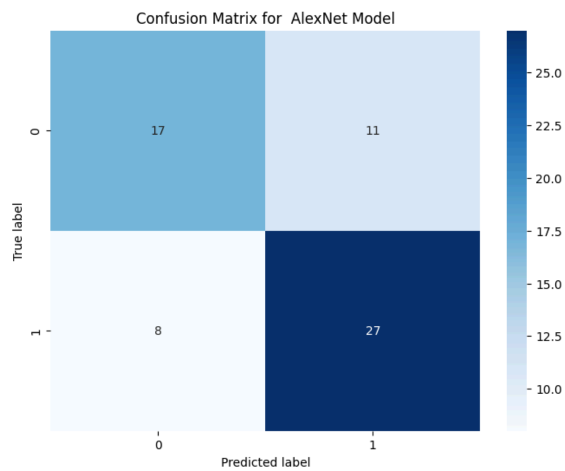
12. CNN Model – Simplified ResNet50



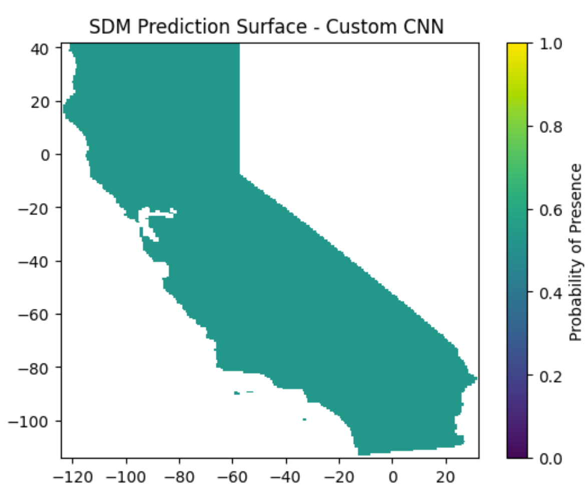


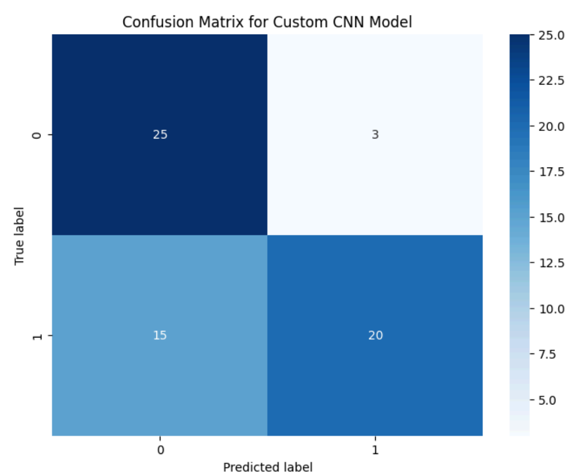
13. CNN Model – AlexNet





14. CNN Model – Custom CNN





Rarified Points Final Results

	Model Name	Type	Epoch	Batch Size	Validation Accuracy	Validation Precision	Validation Recall	Validation F1 Score	Validation AUC	Test Accuracy	Test Precision	Test Recall	Test F1 Score	Test AUC
0	Stacked Classifier	Traditional	-	-	0.931507	0.931034	0.900000	0.915254	0.962791	0.958904	0.976190	0.953488	0.964706	0.965891
1	Gradient Boosting	Traditional	-	-	0.945205	0.933333	0.933333	0.933333	0.989922	0.958904	0.976190	0.953488	0.964706	0.994574
2	XGBoost	Traditional	-	-	0.945205	0.933333	0.933333	0.933333	0.983721	0.945205	0.975610	0.930233	0.952381	0.996124
3	Random Forest	Traditional	-	-	0.958904	0.965517	0.933333	0.949153	0.991085	0.958904	0.976190	0.953488	0.964706	0.994961
4	Neural Network	Deep Learning	20	32	0.904110	0.848485	0.933333	0.888889	0.954264	0.931507	0.931818	0.953488	0.942529	0.975969
5	Multi Layer Perceptron	Deep Learning	20	32	0.917808	0.852941	0.966667	0.906250	0.972093	0.945205	0.914894	1.000000	0.955556	0.975969
6	Autoencoder	Deep Learning	20	32	0.821918	0.729730	0.900000	0.805970	0.883721	0.821918	0.800000	0.930233	0.860215	0.931008
7	Autoencoder 2	Deep Learning	20	32	0.849315	0.756757	0.933333	0.835821	0.892248	0.821918	0.800000	0.930233	0.860215	0.808527
8	Deep Belief Network	Deep Learning	40	32	0.863014	0.777778	0.933333	0.848485	0.881783	0.876712	0.826923	1.000000	0.905263	0.868217
9	Gated Recurrent Network	Deep Learning	20	32	0.931507	0.903226	0.933333	0.918033	0.965116	0.945205	0.953488	0.953488	0.953488	0.973643
10	Transformer Network	Deep Learning	20	32	0.917808	0.875000	0.933333	0.903226	0.956589	0.945205	0.953488	0.953488	0.953488	0.985271
11	LeNet	Convolutional	20	32	0.822581	0.900000	0.771429	0.830769	0.875132	0.793651	0.823529	0.800000	0.811594	0.833673
12	VGG	Convolutional	20	32	0.790323	0.892857	0.714286	0.793651	0.844444	0.714286	0.840000	0.600000	0.700000	0.833673
13	ResNet50	Convolutional	20	32	0.741935	0.851852	0.657143	0.741935	0.806349	0.619048	0.761905	0.457143	0.571429	0.707143
14	ResNet50_Simpl	Convolutional	20	32	0.854839	0.906250	0.828571	0.865672	0.897354	0.730159	0.800000	0.685714	0.738462	0.825510
15	Inception	Convolutional	20	32	0.725806	0.714286	0.857143	0.779221	0.796825	0.746032	0.720930	0.885714	0.794872	0.807143
16	AlexNet	Convolutional	20	32	0.806452	0.870968	0.771429	0.818182	0.846032	0.746032	0.787879	0.742857	0.764706	0.831122
17	MobileNet	Convolutional	20	32	0.741935	0.913043	0.600000	0.724138	0.867725	0.634921	0.772727	0.485714	0.596491	0.847959
18	Custom CNN	Convolutional	20	32	0.741935	0.686275	1.000000	0.813953	0.923810	0.698413	0.648148	1.000000	0.786517	0.878571

Insights:

Performance on Rarified Points:

1) **Traditional Models:**
   Traditional machine learning models like Gradient Boosting, XGBoost, and Random Forest show high performance on rarified data. These models are well-suited to smaller datasets and can effectively capture the underlying patterns without overfitting.

2) **Deep Learning Models:**
   Neural networks and more complex architectures like Gated Recurrent Networks and Transformers perform reasonably well but don't match the traditional models. This might be due to the smaller size of the dataset, which is not sufficient to fully leverage the complex pattern recognition capabilities of these models.

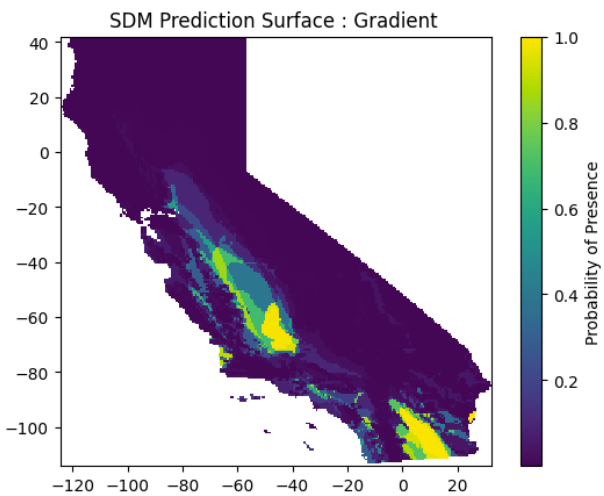
3) **Convolutional Neural Networks (CNNs):**
   Performance of CNNs, including specialized architectures like ResNet and MobileNet, is notably lower compared to other models. CNNs typically require a large amount of data to perform well, as they are designed to capture spatial hierarchies in data. The limited data in the rarified set may not provide enough information for these models to effectively learn.

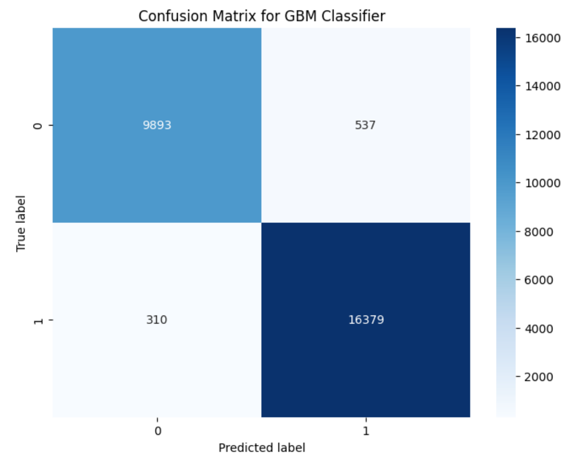
Carrots raw points pseudo absence data with Isolation Forest – Standard Scaling

Carrots Rarified Points - Activation Map & Confusion Matrix

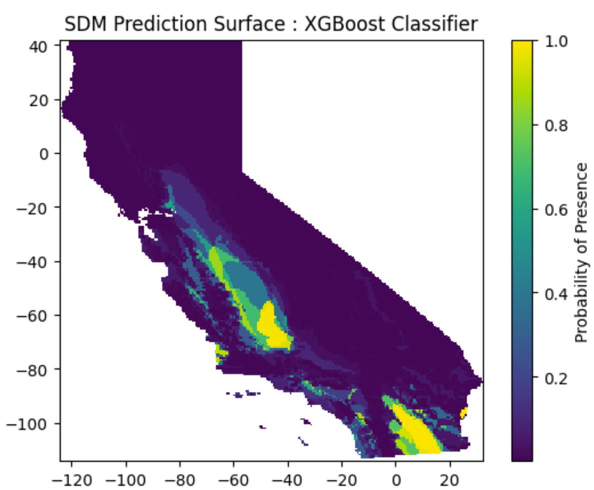
Presence Distribution – `presence (1): 111973, pseudo absence (0): 68817`

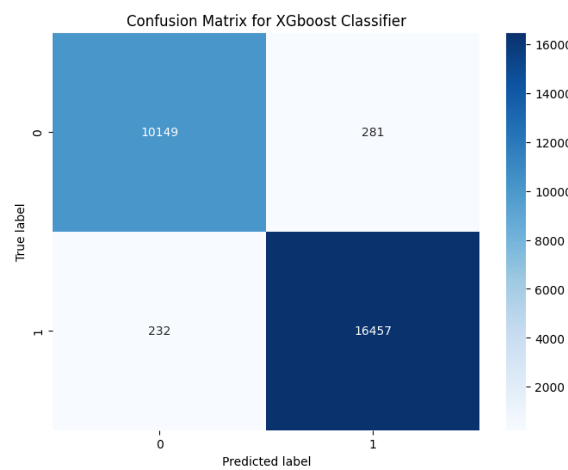
1. Ensemble Model – Gradient Boosting Machine



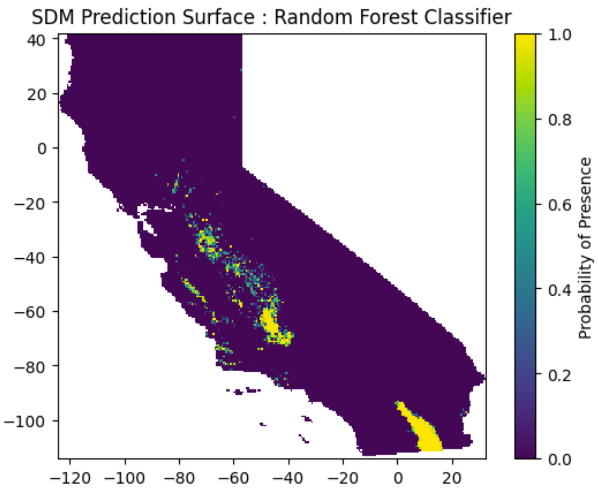


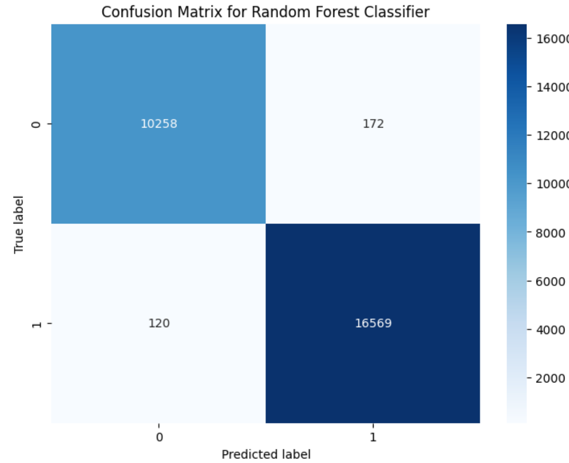
2. Ensemble Model – XGBoost Classifier



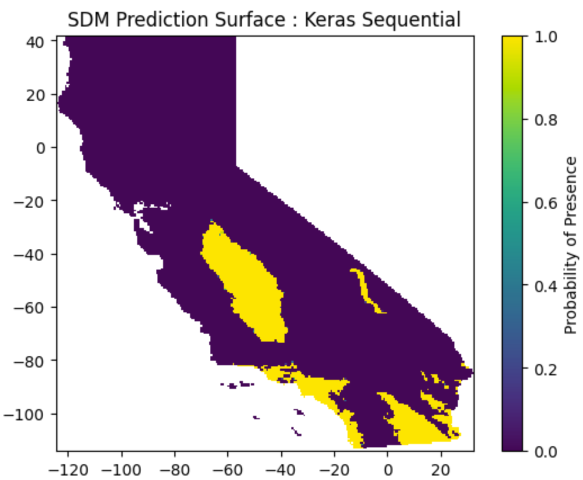


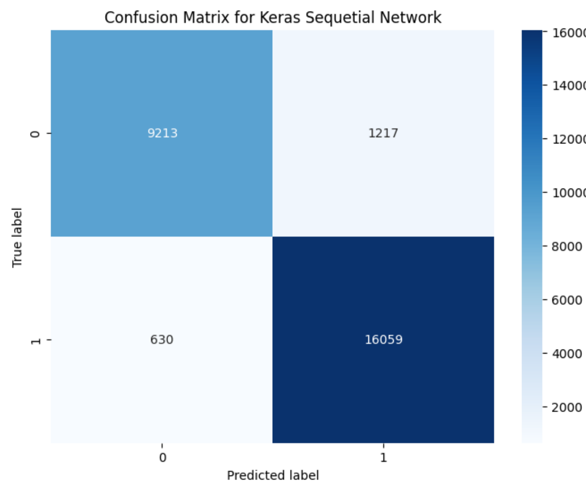
3. Ensemble Model – Random Forest Classifier



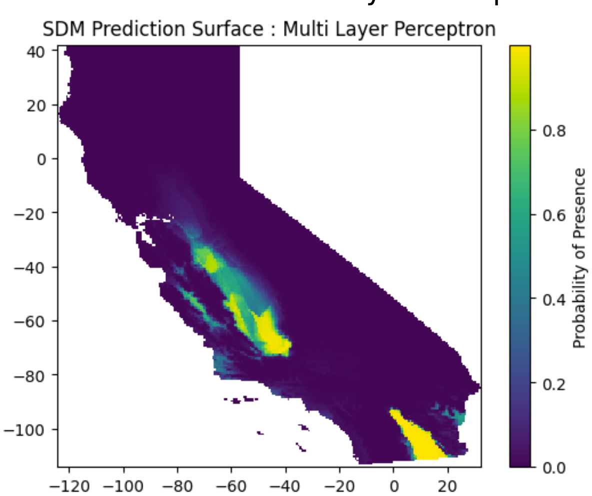


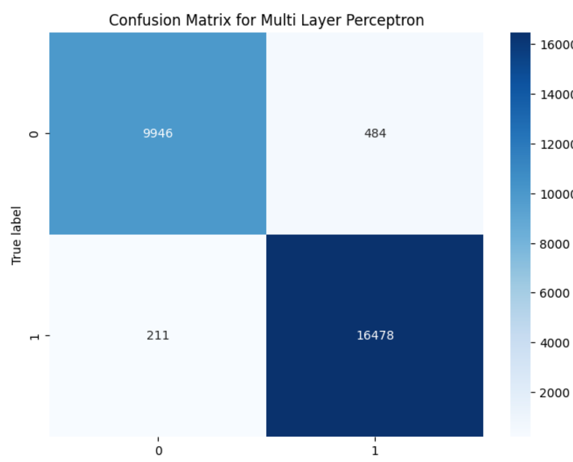
4. ANN Model – Keras Sequential



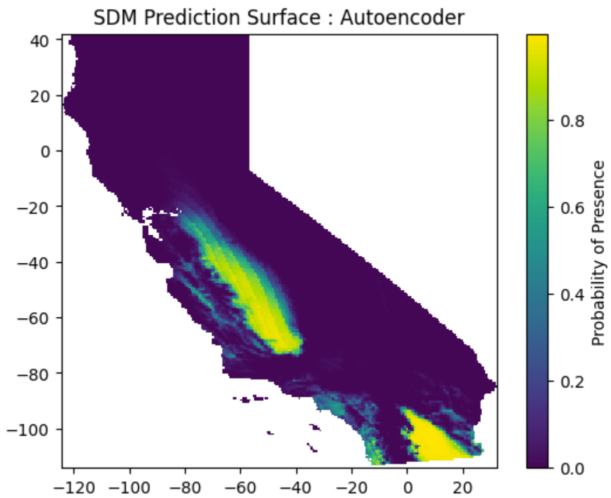


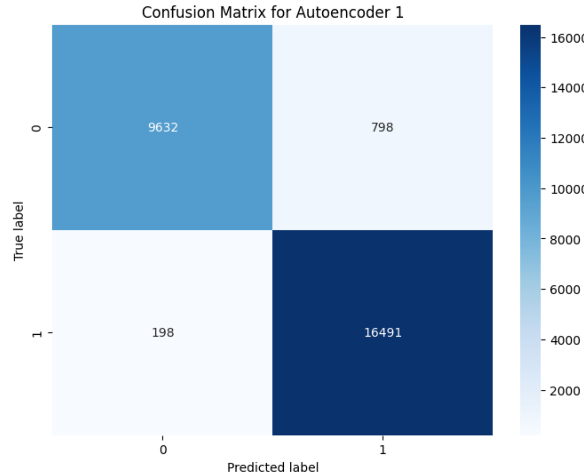
5. ANN Model – Multi Layer Perceptron



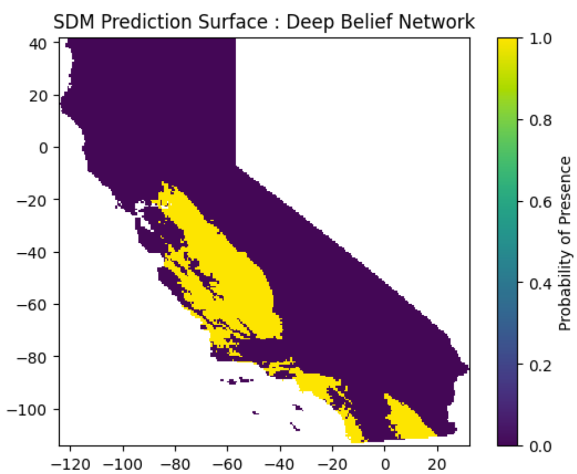


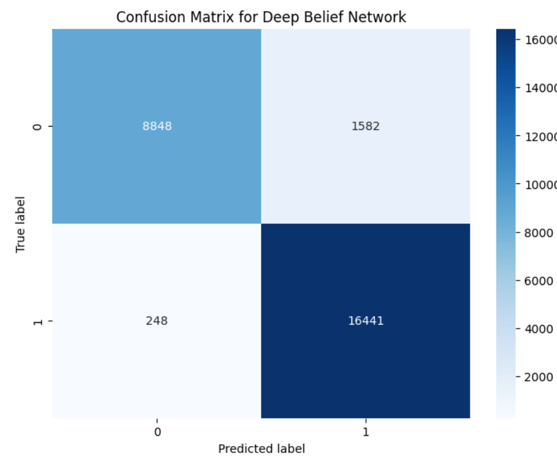
6. ANN Model – Autoencoder



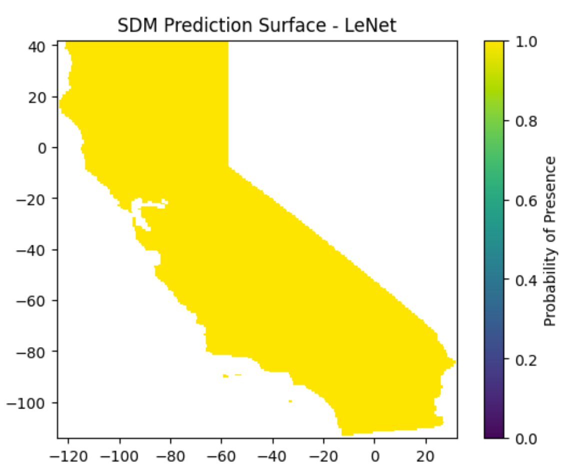


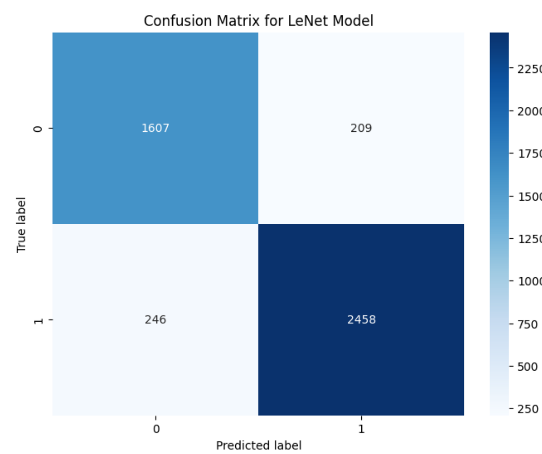
7. ANN Model – Deep Belief Network



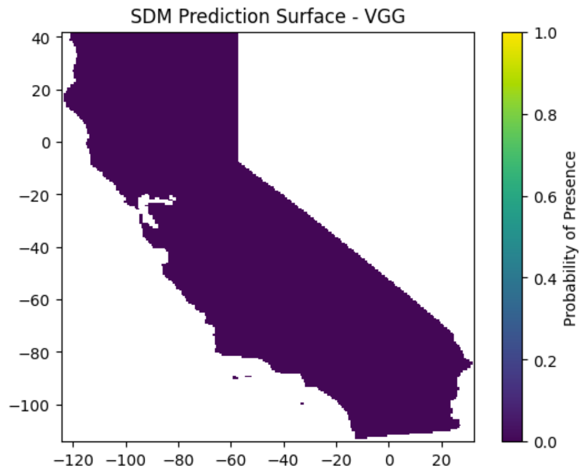


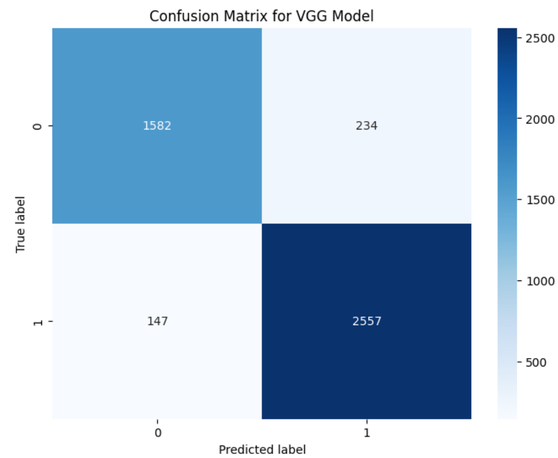
8. CNN Model – LeNet5



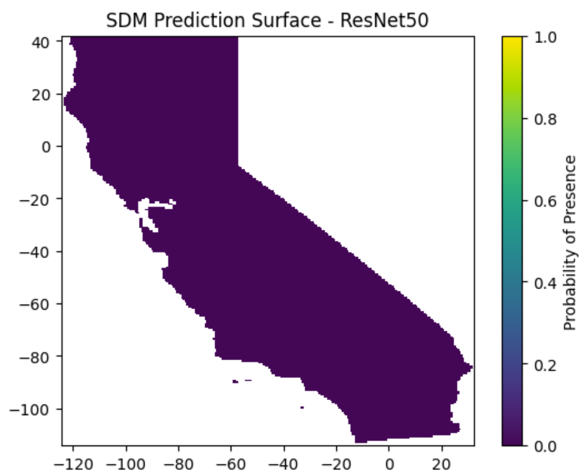


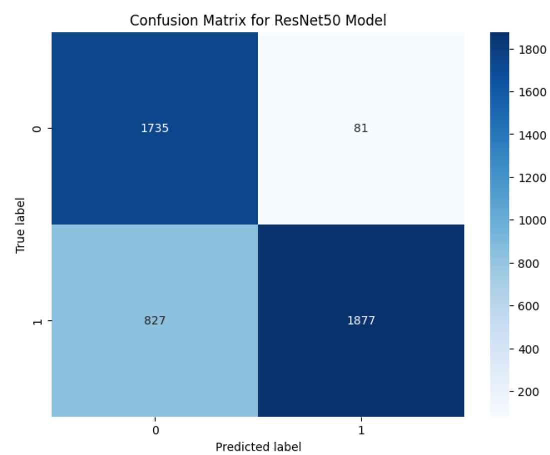
9. CNN Model – VGG



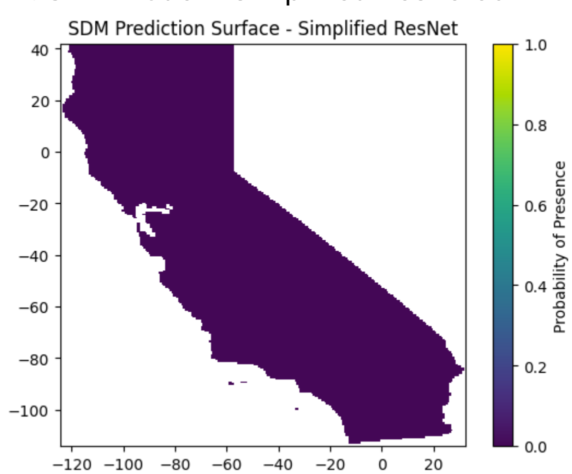


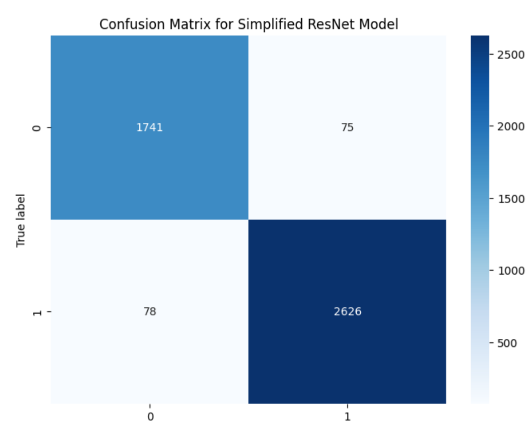
10. CNN Model – ResNet50



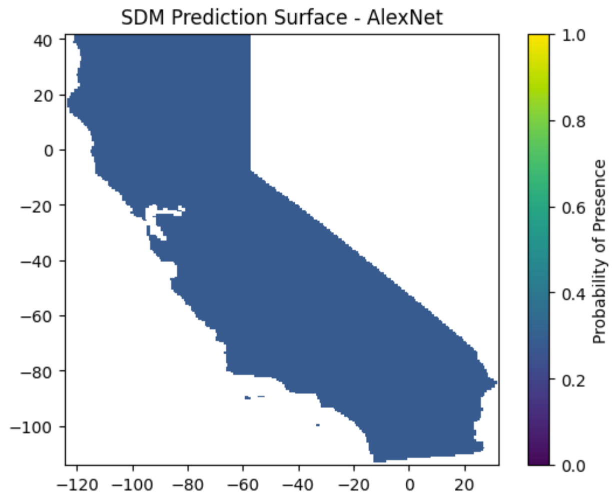


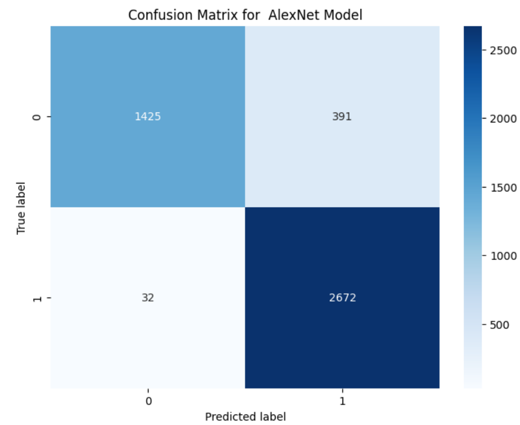
11. CNN Model – Simplified Resnet50



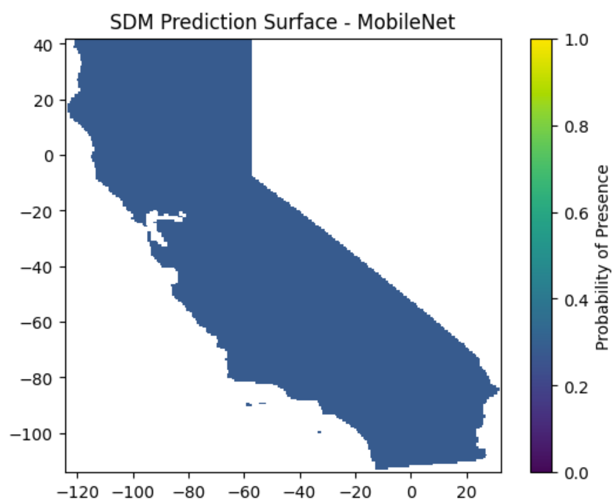


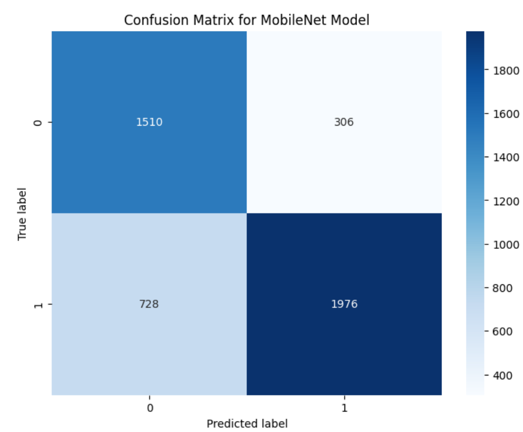
12. CNN Model – AlexNet



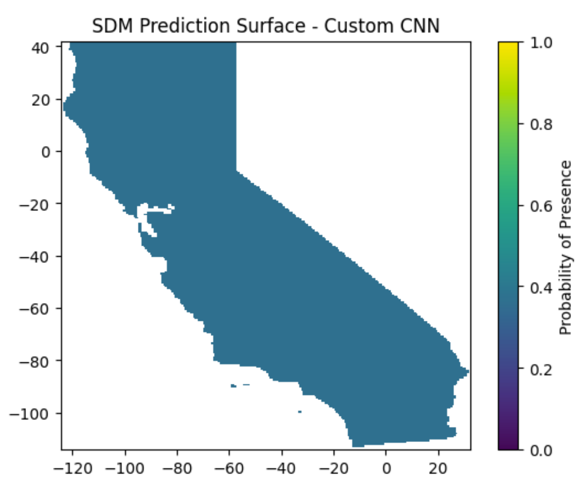


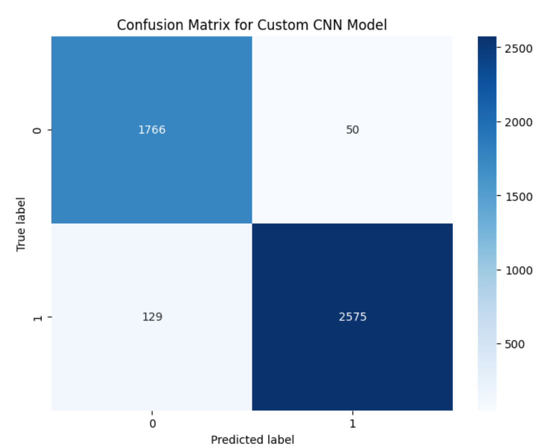
13. CNN Model - MobileNet





14. CNN Model – Custom CNN Architecture





Rarified Points Final Results

	Model Name	Type	Epoch	Batch Size	Validation Accuracy	Validation Precision	Validation Recall	Validation F1 Score	Validation AUC	Test Accuracy	Test Precision	Test Recall	Test F1 Score	Test AUC
0	Gradient Boosting	Traditional	-	-	0.968360	0.969806	0.979296	0.974528	0.992531	0.968767	0.968255	0.981425	0.974795	0.992335
1	XGBoost	Traditional	-	-	0.981378	0.984443	0.985442	0.984942	0.998057	0.981083	0.983212	0.986099	0.984653	0.997951
2	Random Forest	Traditional	-	-	0.989269	0.990120	0.992542	0.991329	0.996356	0.989233	0.989726	0.992810	0.991265	0.996643
3	Neural Network	Deep Learning	20	32	0.837599	0.953798	0.774761	0.855008	0.919535	0.837199	0.952448	0.774103	0.854064	0.921072
4	Multi Layer Perceptron	Deep Learning	20	32	0.975441	0.973520	0.987112	0.980269	0.997350	0.974262	0.971962	0.986638	0.979245	0.997288
5	Autoencoder	Deep Learning	20	32	0.965152	0.956263	0.988842	0.972280	0.990681	0.963937	0.955154	0.987776	0.971191	0.991060
6	Deep Belief Network	Deep Learning	40	32	0.964747	0.957662	0.986575	0.971904	0.958001	0.963789	0.957157	0.985260	0.971005	0.957347
7	LeNet	Convolutional	20	32	0.894446	0.915017	0.901376	0.908146	0.893147	0.899336	0.921635	0.909024	0.915286	0.896968
8	VGG	Convolutional	20	32	0.926754	0.925195	0.950306	0.937583	0.922342	0.915708	0.916159	0.945636	0.930664	0.908391
9	ResNet50	Convolutional	20	32	0.813012	0.963370	0.703746	0.813342	0.886430	0.799115	0.958631	0.694157	0.805234	0.872130
10	ResNet50_Simpl	Convolutional	20	32	0.968356	0.972488	0.972859	0.972673	0.995231	0.966150	0.972233	0.971154	0.971693	0.993823
11	AlexNet	Convolutional	20	32	0.915911	0.877958	0.992737	0.931826	0.901518	0.906416	0.872347	0.988166	0.926652	0.886429
12	MobileNet	Convolutional	20	32	0.776278	0.856508	0.737003	0.792275	0.783636	0.771239	0.865907	0.730769	0.792619	0.781134
13	Custom CNN	Convolutional	20	32	0.961053	0.976935	0.955275	0.965984	0.992506	0.960398	0.980952	0.952293	0.966410	0.992929

Insights:

Performance on Raw Points:

1. **Traditional Models:**
   While still performing well, traditional models like Gradient Boosting and XGBoost show a slight decrease in relative performance compared to their performance on rarified points. This could be due to the increased complexity and noise in the larger dataset, which might introduce challenges in model training and generalization.

2. **Deep Learning Models:**
   These models show significant improvement in performance on the larger dataset. The ample data allows these models to effectively train their numerous parameters, leading to better generalization and performance. Notably, Multi Layer Perceptrons and Autoencoders show excellent results, benefiting from the richer dataset to learn more complex patterns.

3. **Convolutional Neural Networks (CNNs):**
   CNNs exhibit a substantial improvement in performance when trained on raw points, highlighting their ability to excel in larger datasets. Models like Custom CNN and ResNet show remarkable improvements, underlining the strength of CNNs in handling high-dimensional data and capturing spatial relationships.

Key Insights:

1) **Data Dependency:**
   The performance discrepancy between models trained on rarified and raw points underlines the importance of dataset size and diversity for model training, especially for complex models like CNNs and deep learning architectures.

2) **Model Suitability:**
   Traditional models are more robust to smaller datasets and can maintain high performance even with limited data. In contrast, deep learning and especially CNN models require larger datasets to fully harness their potential.

3) **Complexity and Overfitting:**
   The simpler models tend to perform better on smaller datasets as they are less prone to overfitting, whereas deep learning models, with their large number of parameters, can overfit smaller datasets but excel when provided with ample data.