

Kenan, Fayçal & Lorenzo

Sommaire

I. Reconnaissance biométrique

II. Deep learning & CNN

III. Entrainement de modèles

IV. Application

Sommaire

I. Reconnaissance biométrique

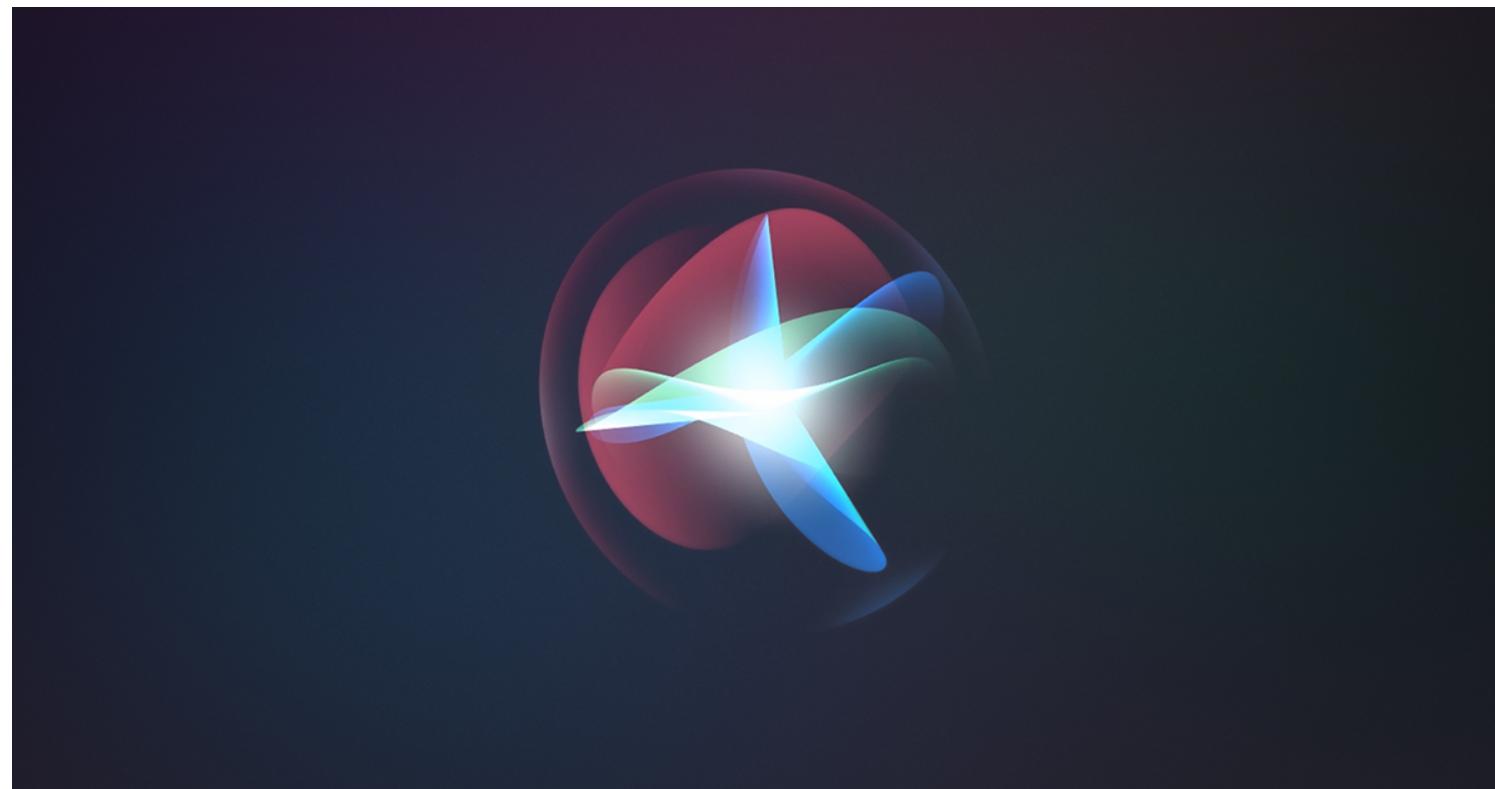
II. Deep learning & CNN

III. Entrainement de modèles

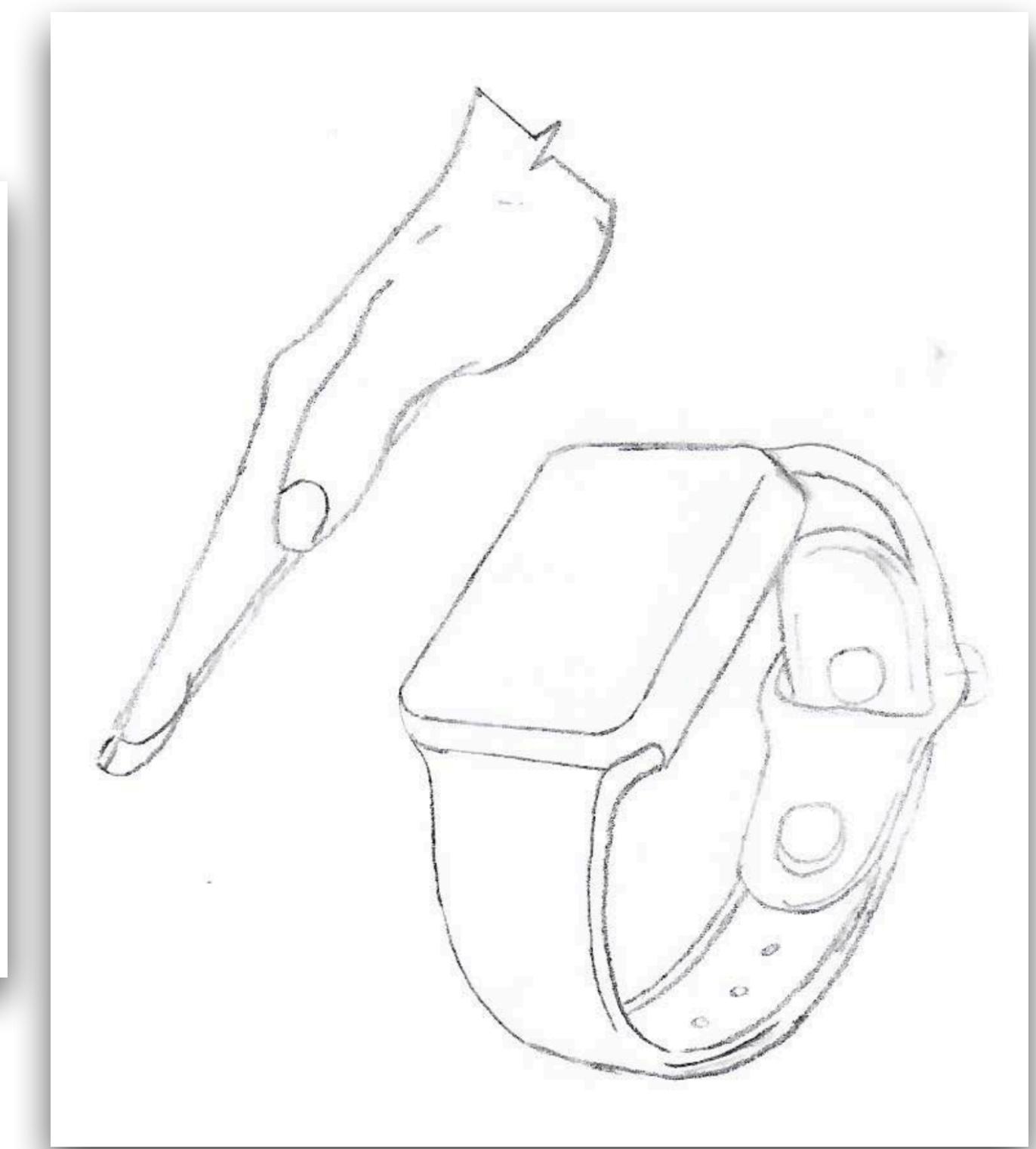
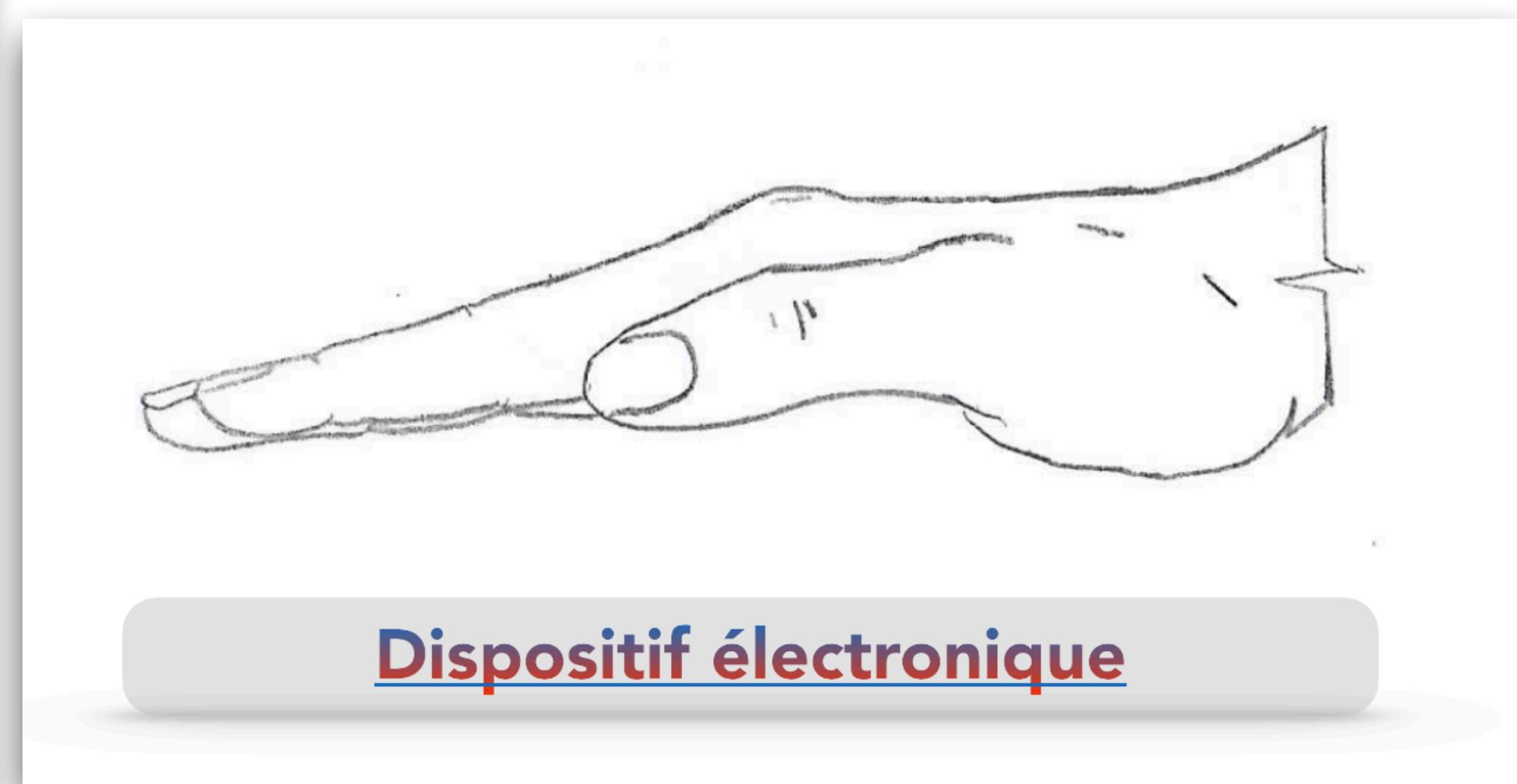
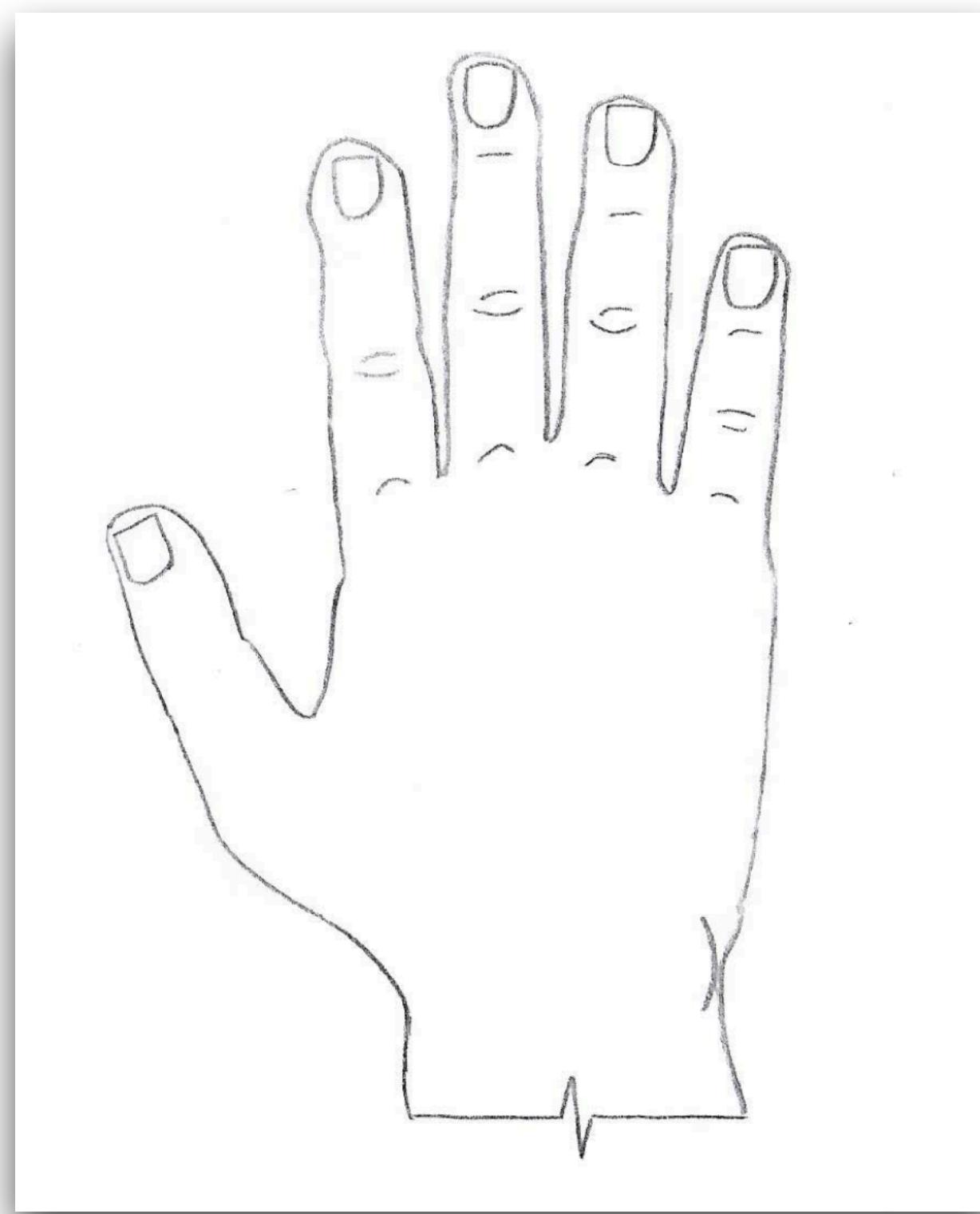
IV. Application

Biométrie

« tâche très simple qui peut être très complexe »



Reconnaissance des veines palmaires



Reconnaissance des veines palmaires

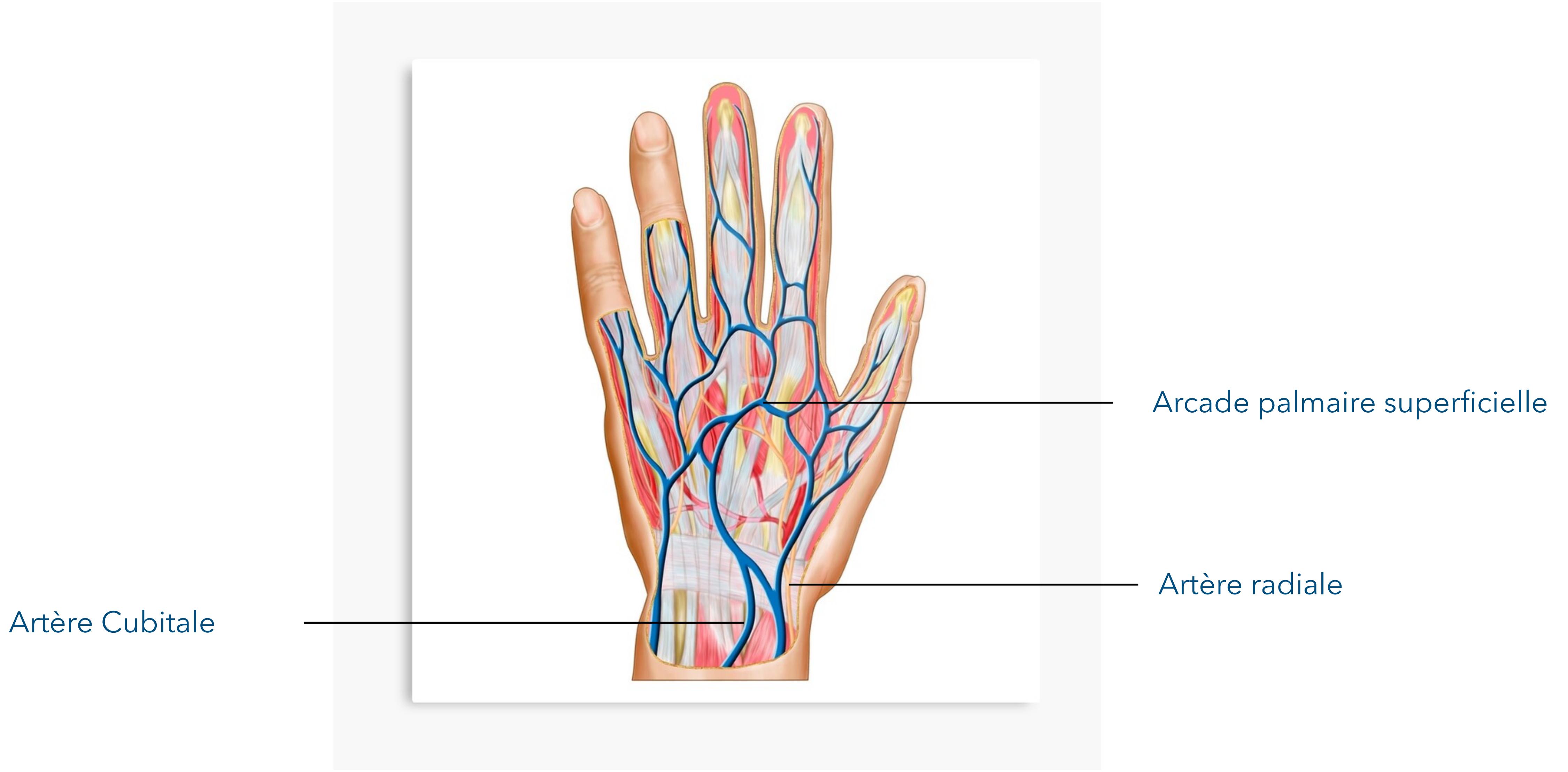
Définition



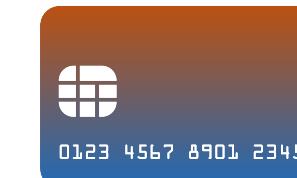
Histoire

- Joseph Rice
- Hitachi
- Fujitsu

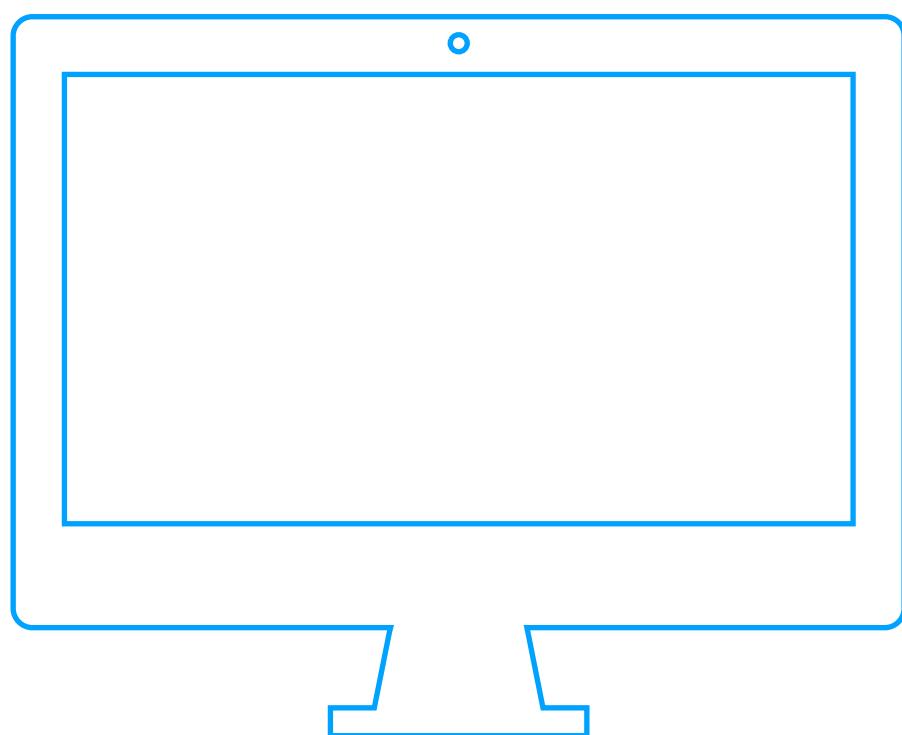
Modalité physiologique



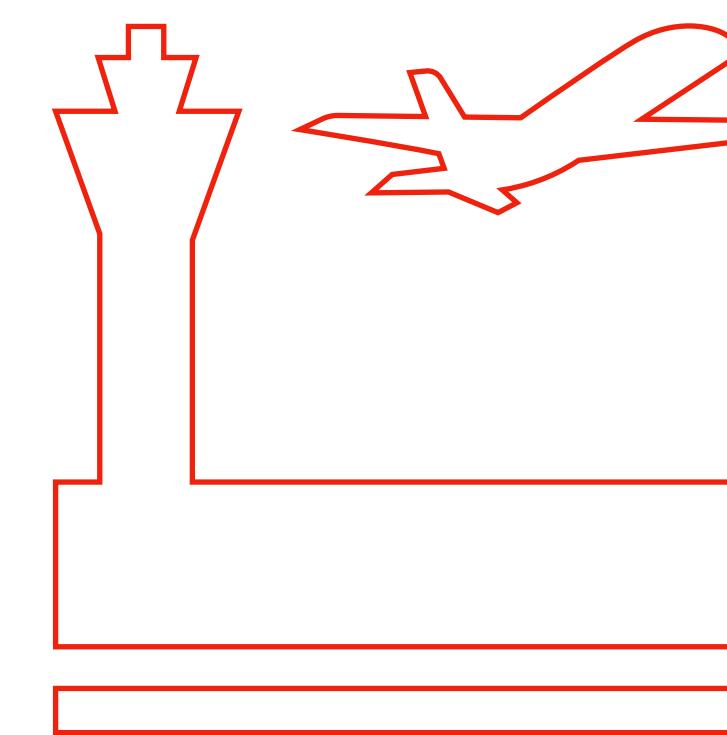
Domaines d'application



Authentification d'accès à la connexion



Authentification d'accès physique

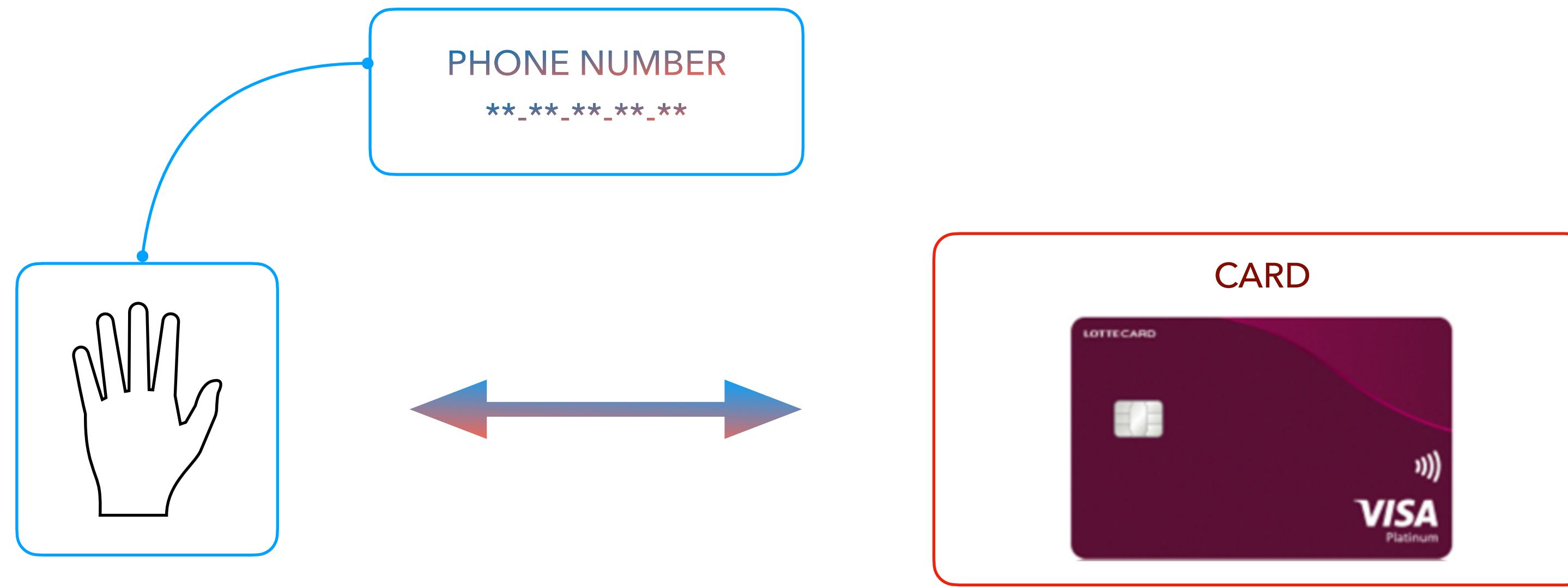


Système de paiement

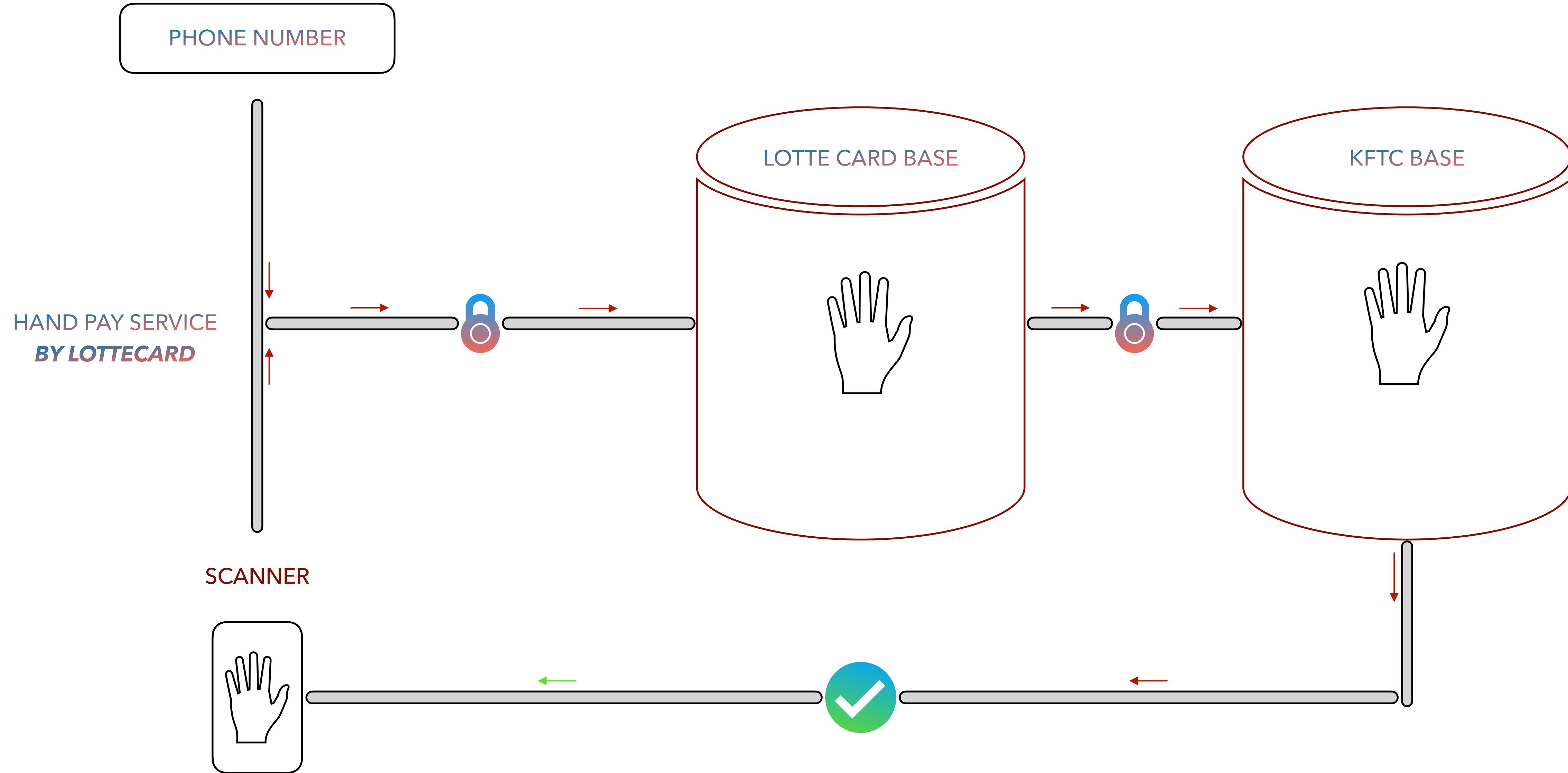
Hand Pay Service By LOTTECARD



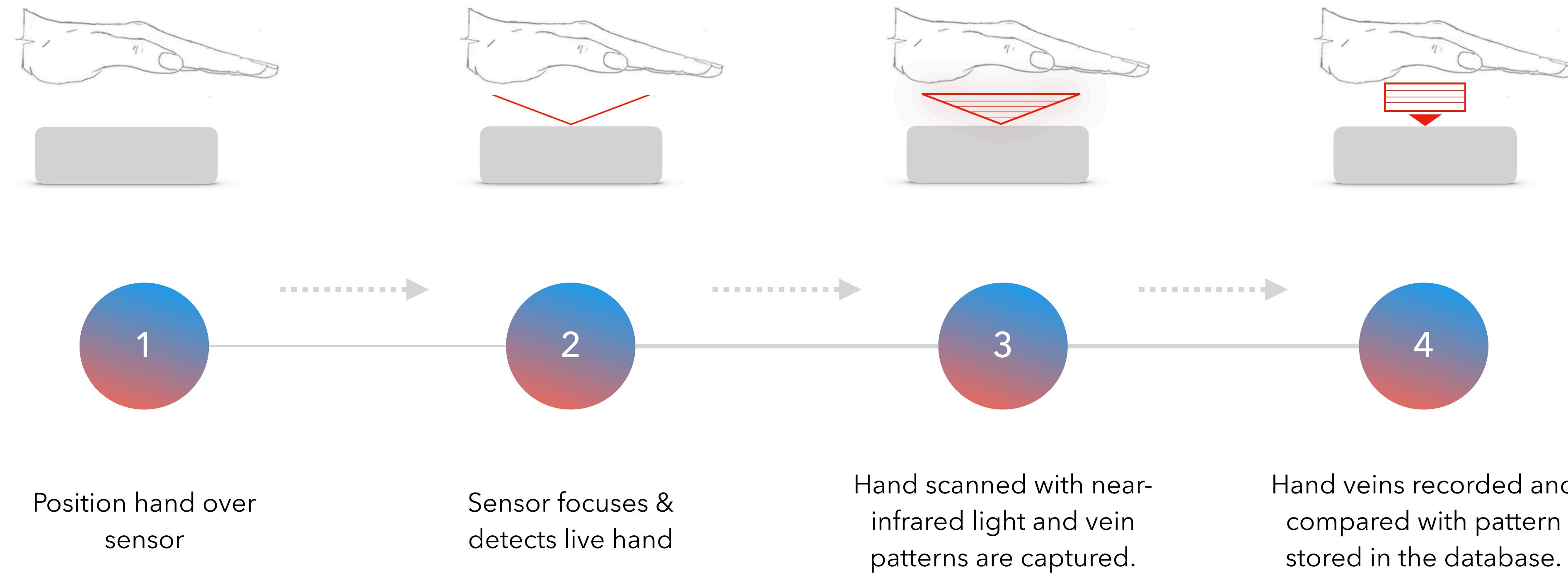
Hand Pay Service By LOTTECARD



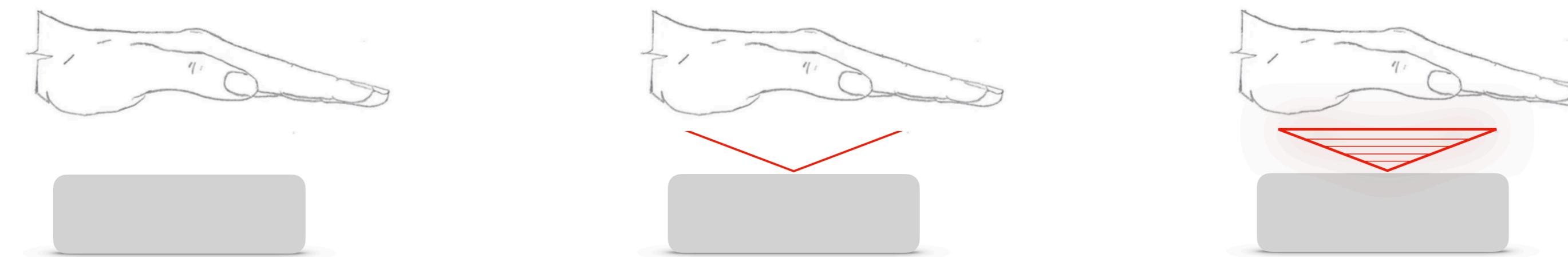
Hand Pay Service By LOTTECARD



Comment ça marche ?



La détection des empreintes palmaires



Position hand over
sensor



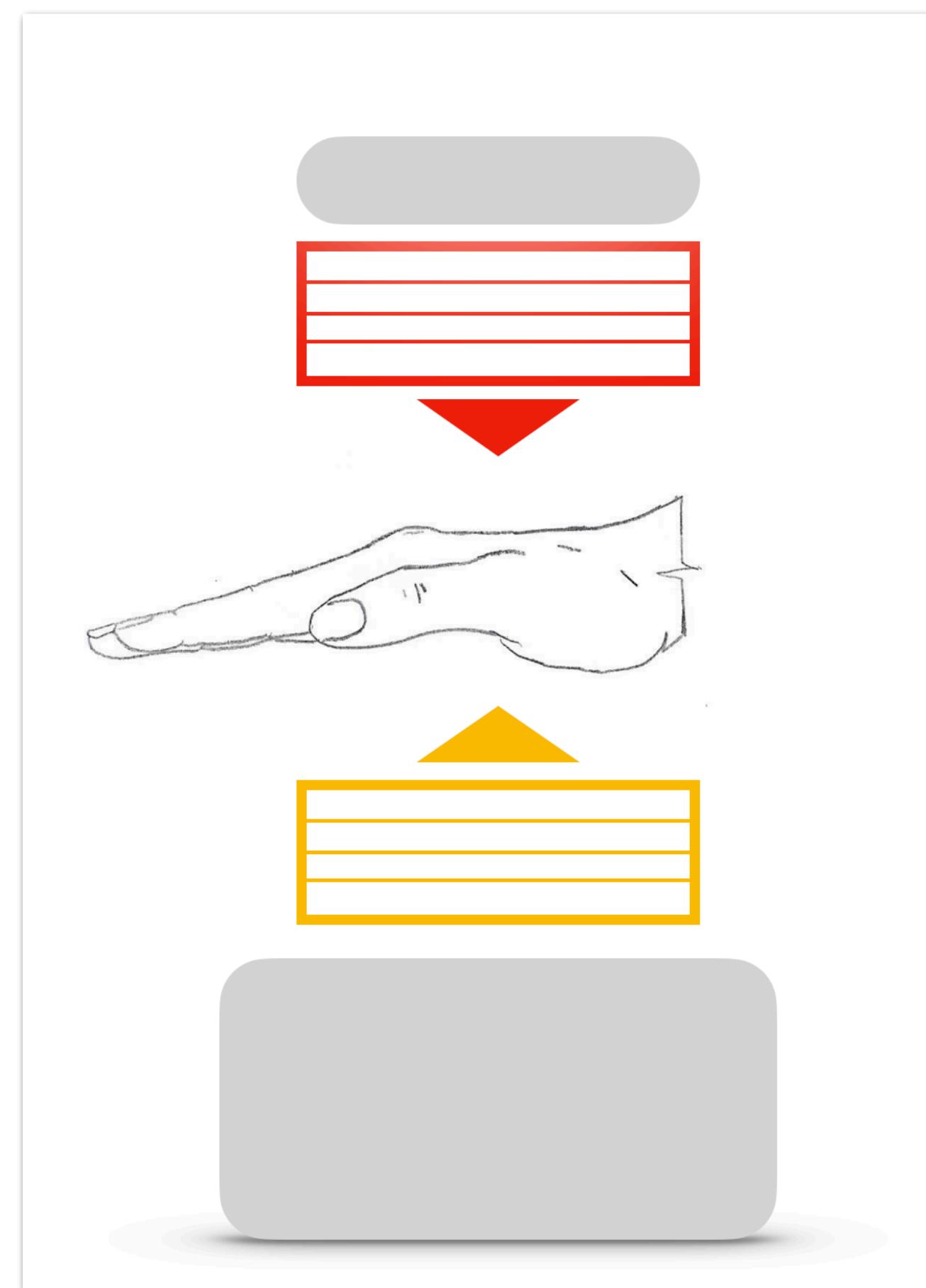
Sensor focuses &
detects live hand



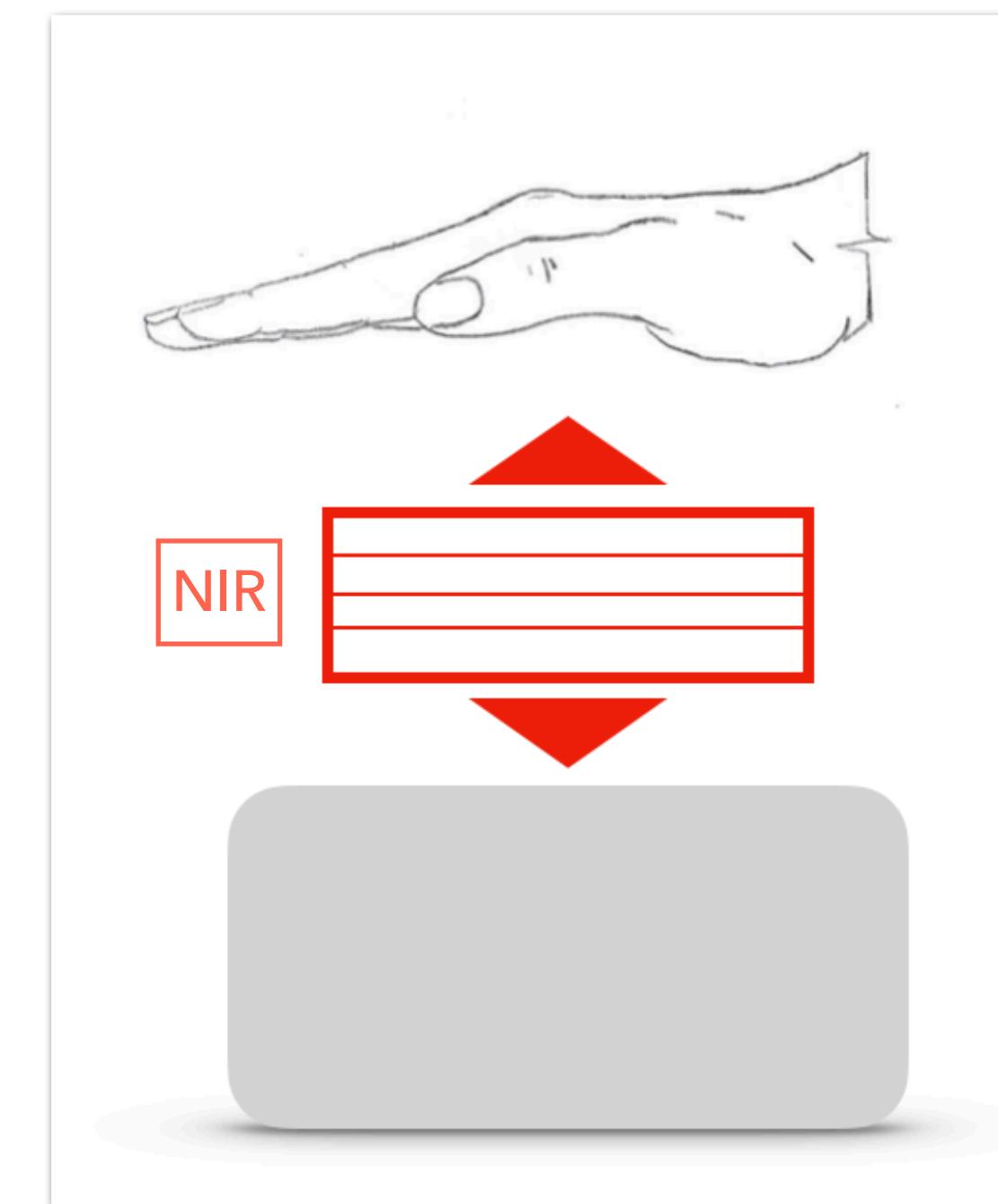
Hand scanned with near-
infrared light and vein
patterns are captured.

Méthodes d'acquisition

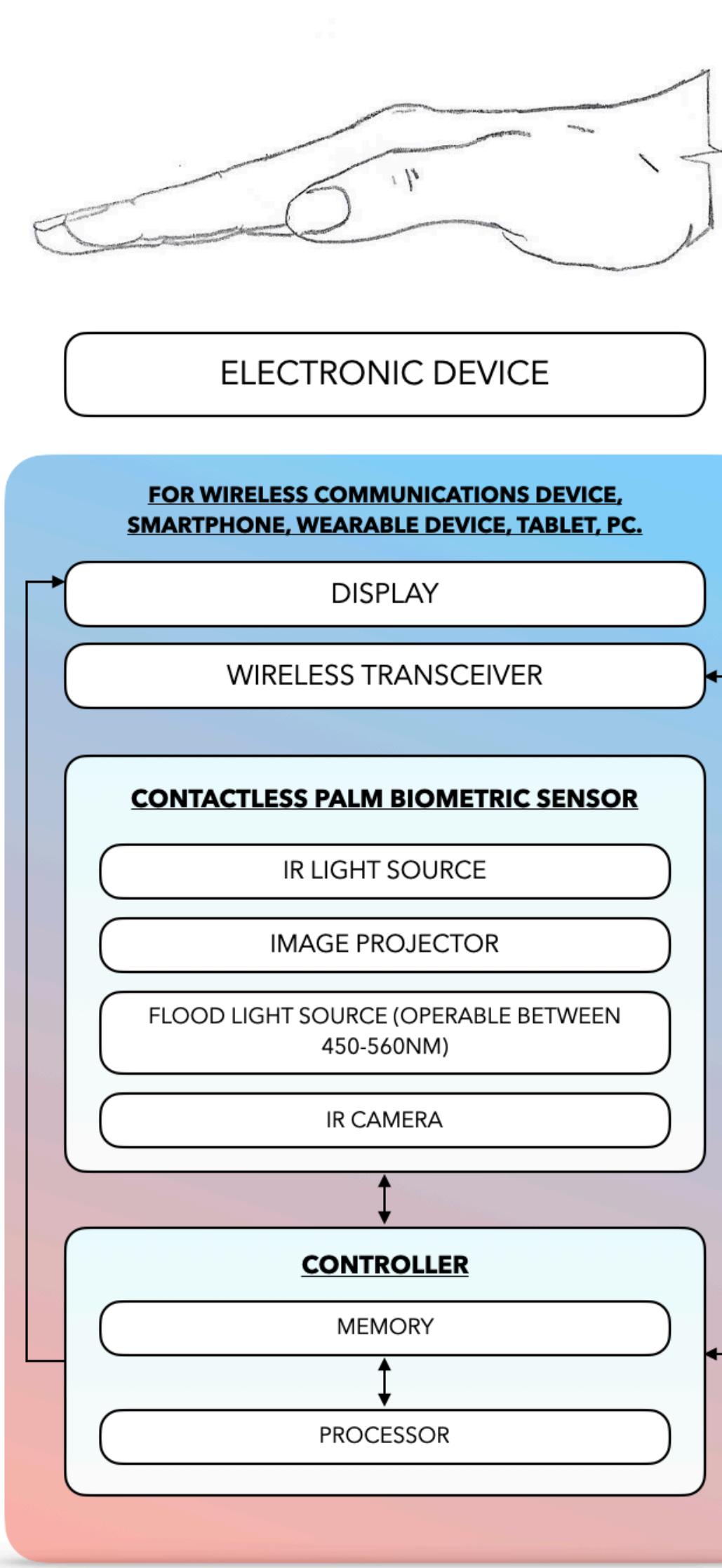
Méthode de transmission



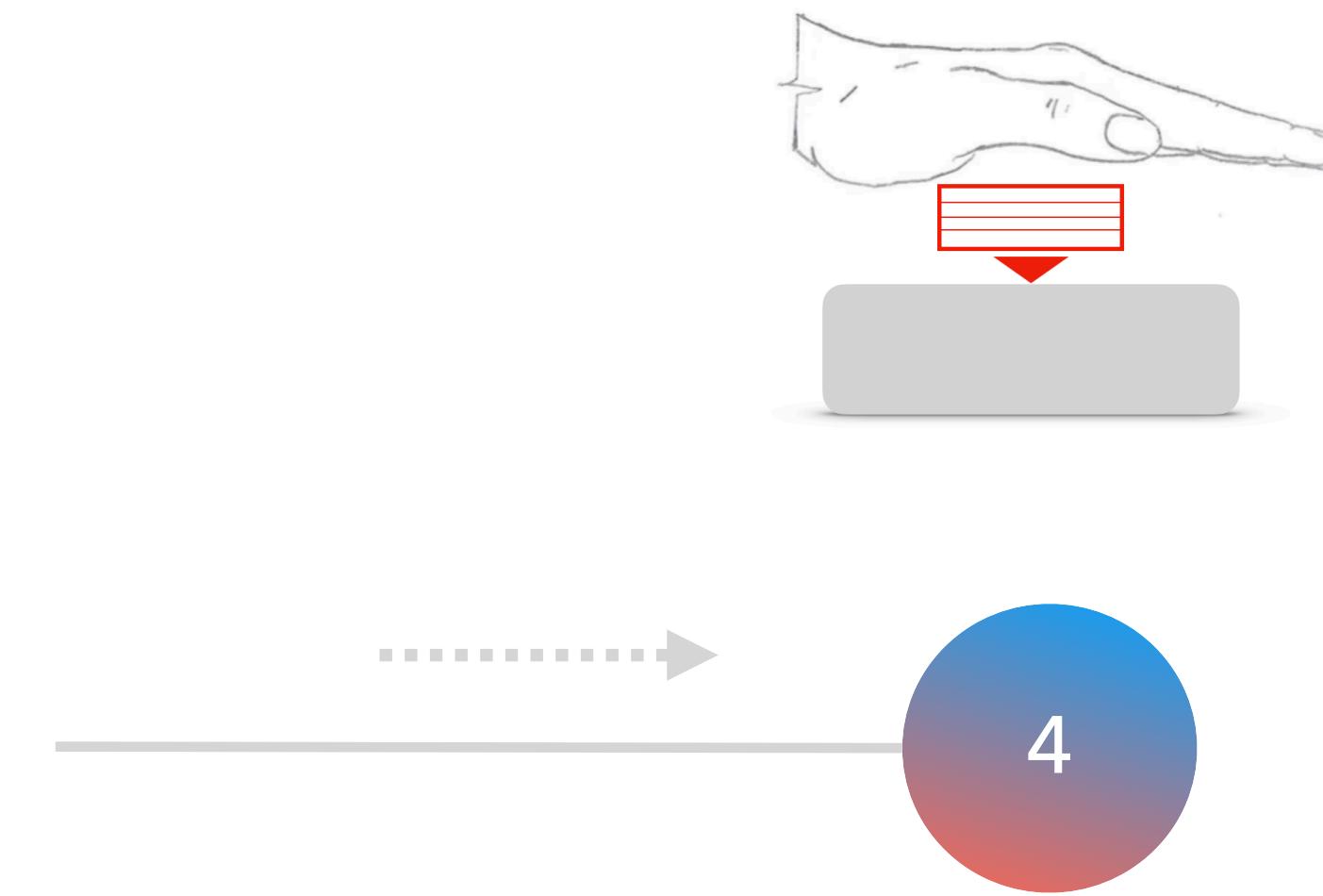
Méthode de réflexion



Composition d'un dispositif biométrique

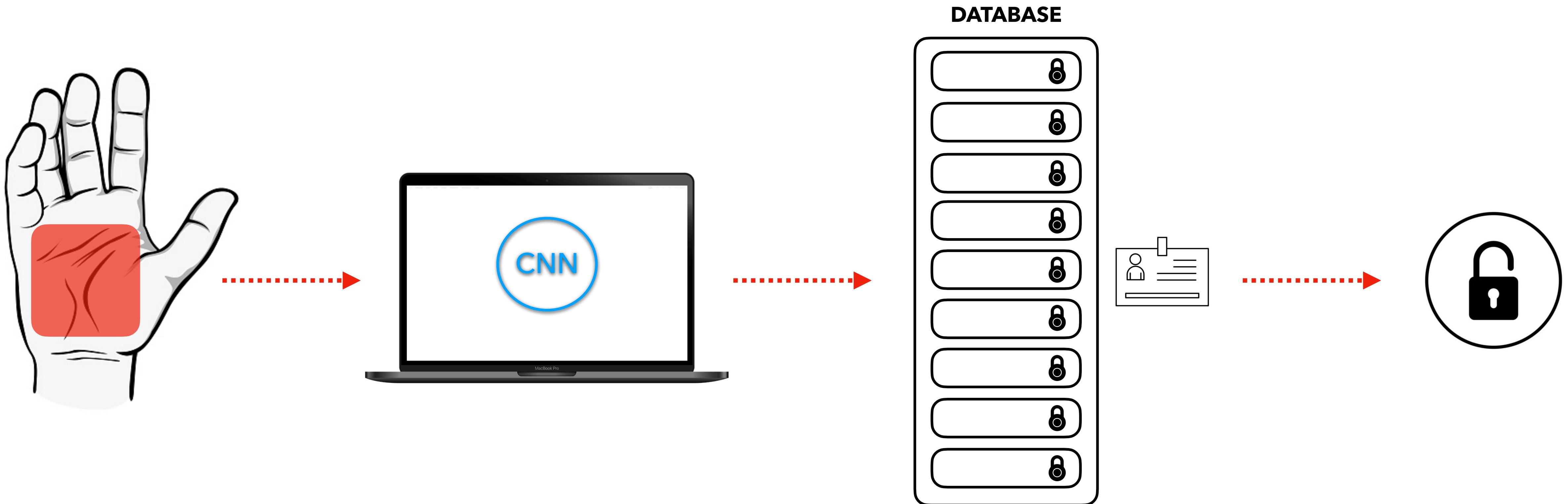


Authentification des empreintes palmaires



Hand veins recorded and
compared with pattern
stored in the database.

Authentification des empreintes palmaires



Sommaire

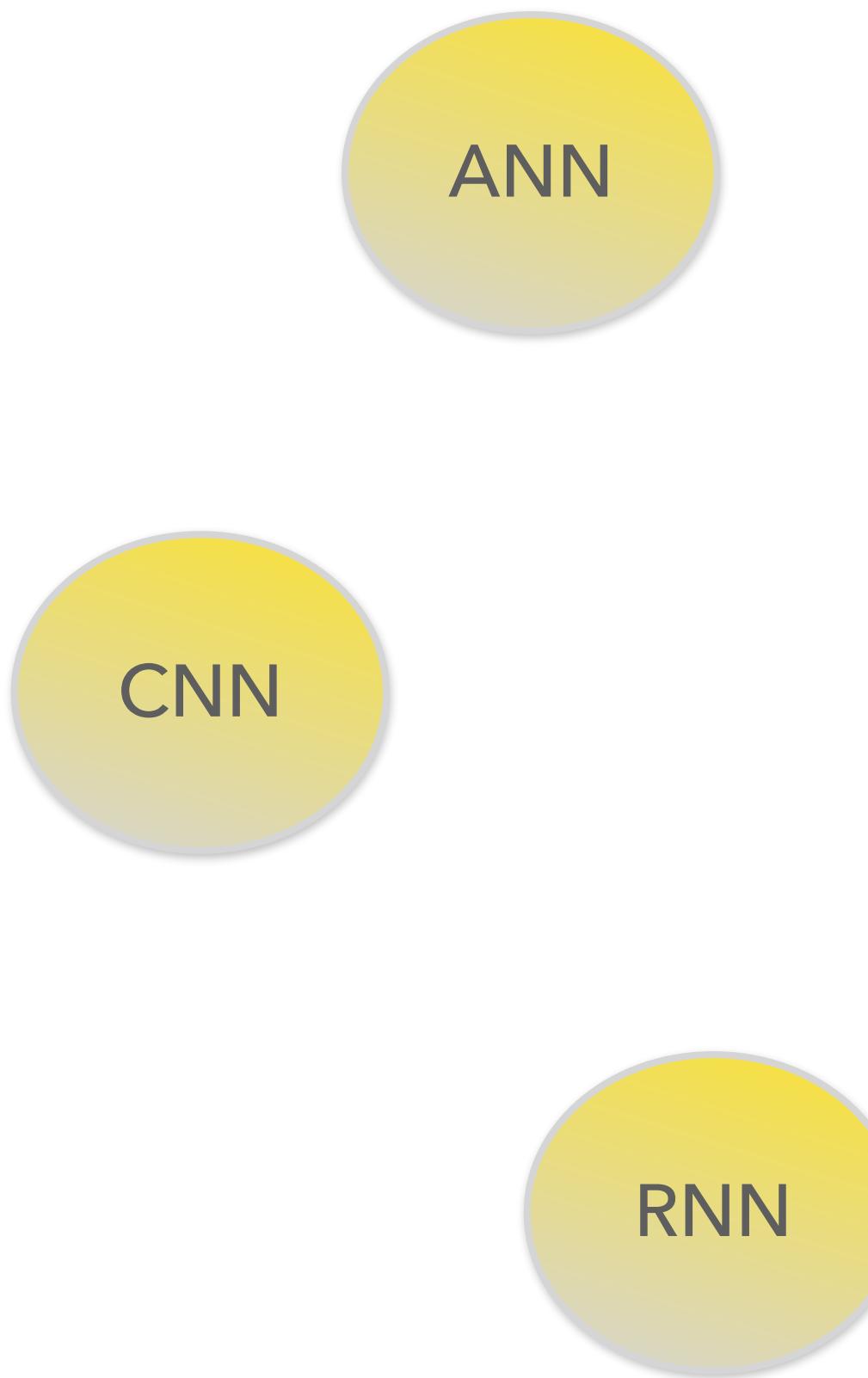
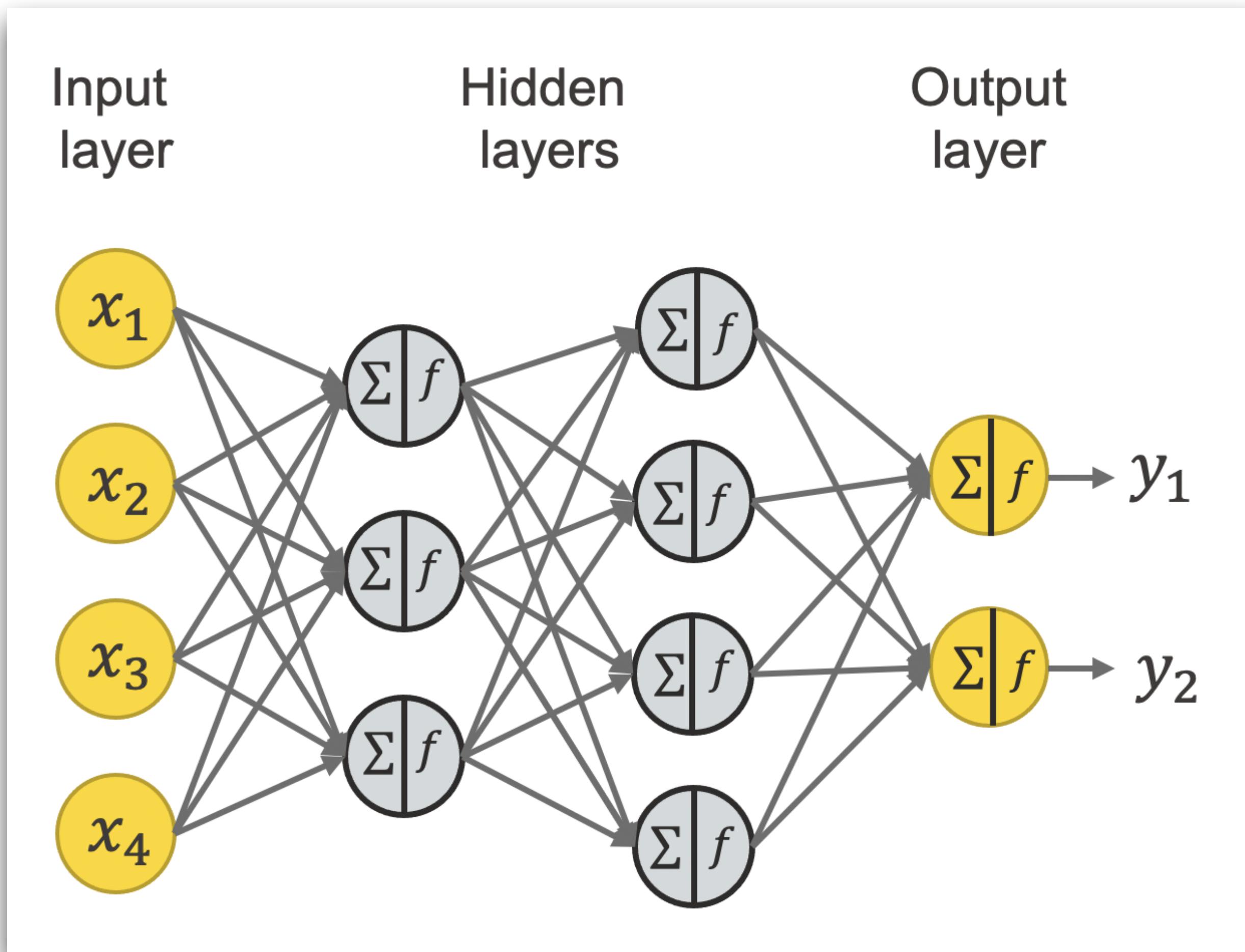
I. Reconnaissance biométrique

II. Deep learning & CNN

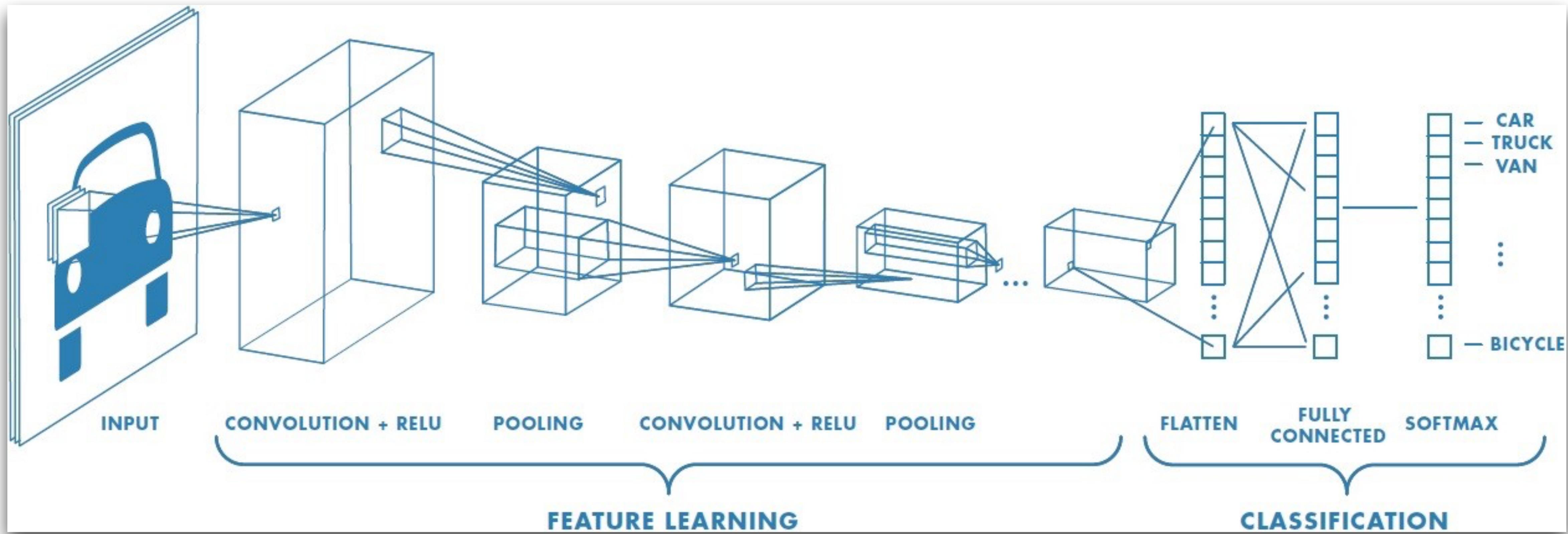
III. Entrainement de modèles

IV. Application

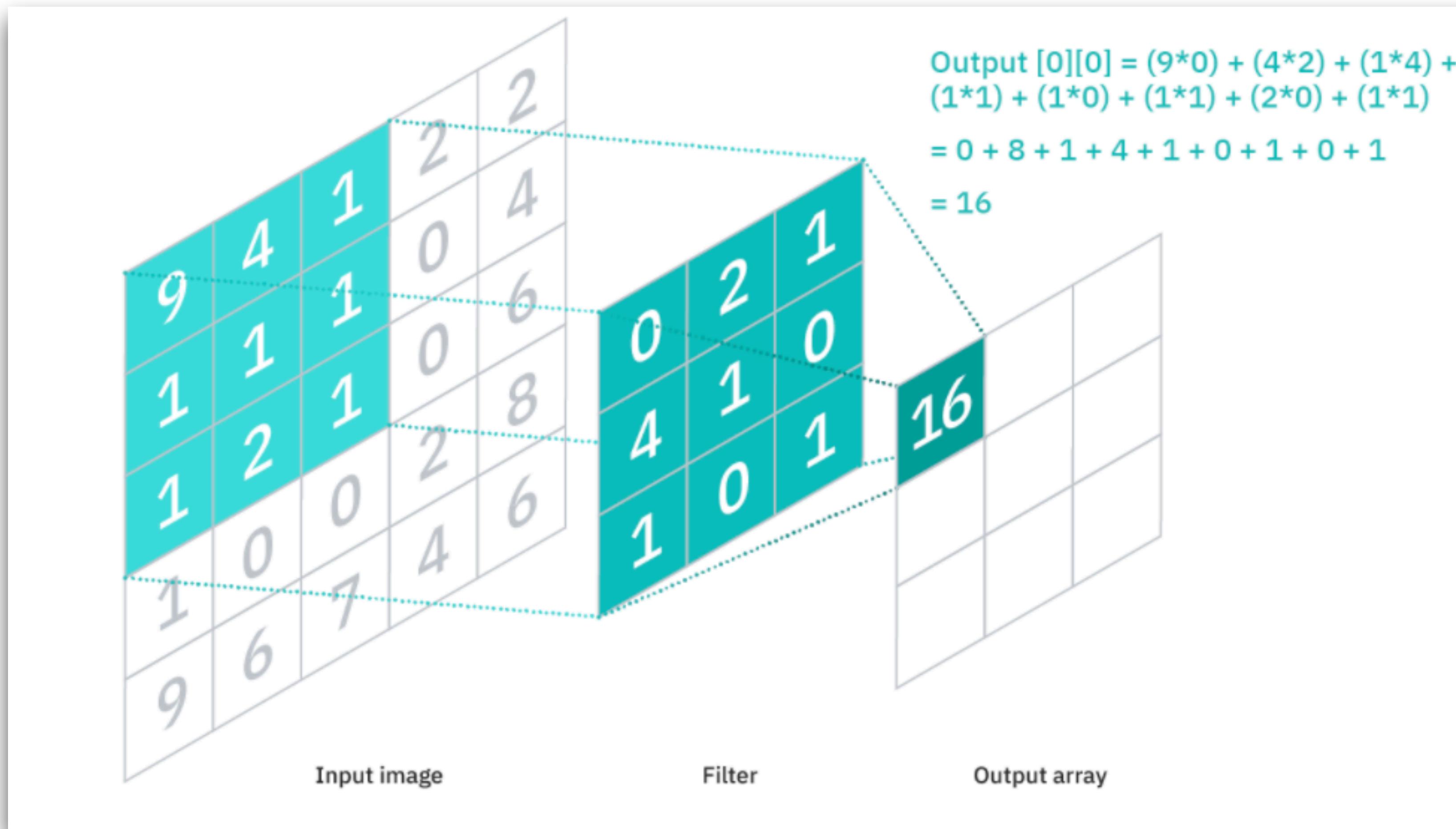
Deep learning



Convolutional Neural Networks



Partie Convulsive



Partie Pooling

Max Pooling

12	20	30	0
8	12	2	0
34	70	37	4
112	100	25	2

$2*2$ Max-Pool

20	30
112	372

Sommaire

I. Reconnaissance biométrique

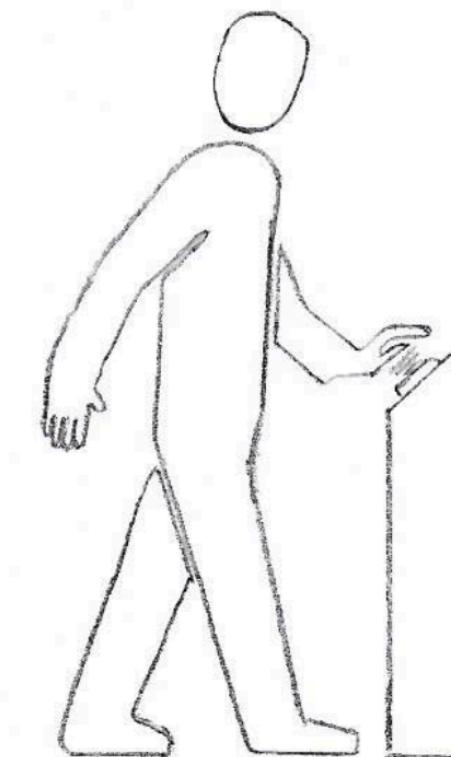
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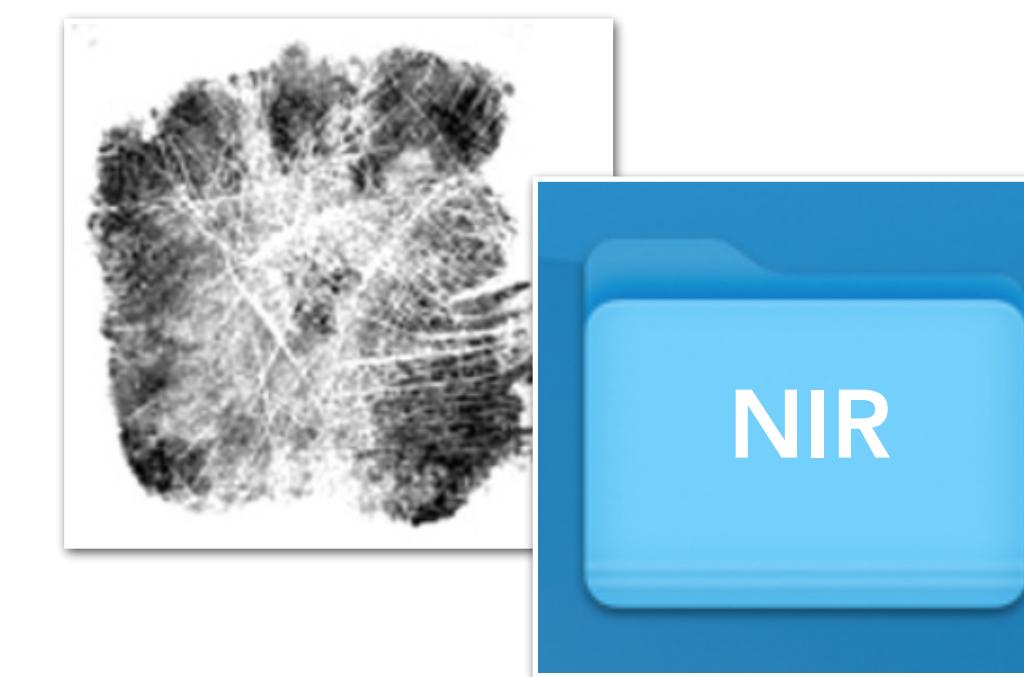
IV. Application

Contexte et Objectif

500 utilisateurs ont
enregistré et scanné leurs
empreintes palmaires



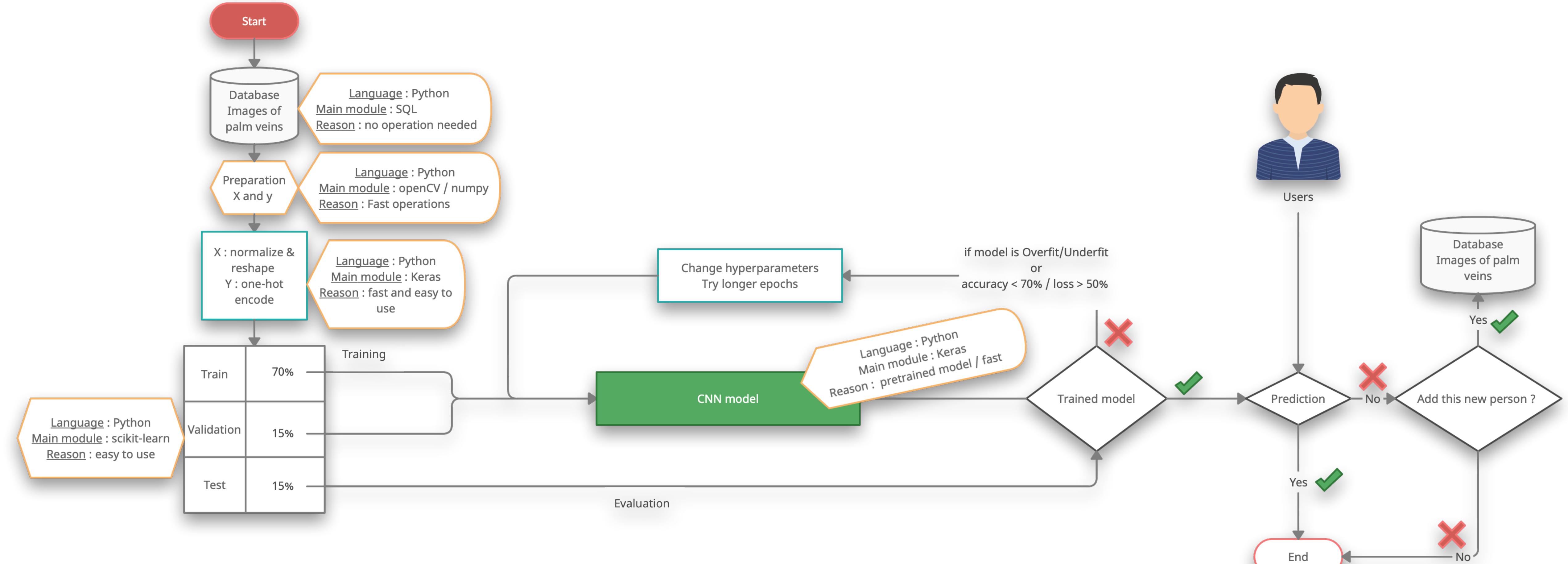
Réception de la NIR
Database: 6000 images



Entrainement de modèles
CNN afin de prédire
l'identité de l'utilisateur



Architecture



Résultat - Semestre 1

Modèles CNN

K Keras

Model	Size (MB)	Top-1 Accuracy	Top-5 Accuracy	Parameters	Depth	Time (ms) per inference step (CPU)	Time (ms) per inference step (GPU)
Xception	88	0.790	0.945	22,910,480	126	109.42	8.06
VGG16	528	0.713	0.901	138,357,544	23	69.50	4.16
VGG19	549	0.713	0.900	143,667,240	26	84.75	4.38
ResNet50	98	0.749	0.921	25,636,712	-	58.20	4.55
ResNet101	171	0.764	0.928	44,707,176	-	89.59	5.19
ResNet152	232	0.766	0.931	60,419,944	-	127.43	6.54
ResNet50V2	98	0.760	0.930	25,613,800	-	45.63	4.42
ResNet101V2	171	0.772	0.938	44,675,560	-	72.73	5.43
ResNet152V2	232	0.780	0.942	60,380,648	-	107.50	6.64
InceptionV3	92	0.779	0.937	23,851,784	159	42.25	6.86
InceptionResNetV2	215	0.803	0.953	55,873,736	572	130.19	10.02
MobileNet	16	0.704	0.895	4,253,864	88	22.60	3.44
MobileNetV2	14	0.713	0.901	3,538,984	88	25.90	3.83
DenseNet121	33	0.750	0.923	8,062,504	121	77.14	5.38
DenseNet169	57	0.762	0.932	14,307,880	169	96.40	6.28
DenseNet201	80	0.773	0.936	20,242,984	201	127.24	6.67
NASNetMobile	23	0.744	0.919	5,326,716	-	27.04	6.70
NASNetLarge	343	0.825	0.960	88,949,818	-	344.51	19.96
EfficientNetB0	29	-	-	5,330,571	-	46.00	4.91
EfficientNetB1	31	-	-	7,856,239	-	60.20	5.55

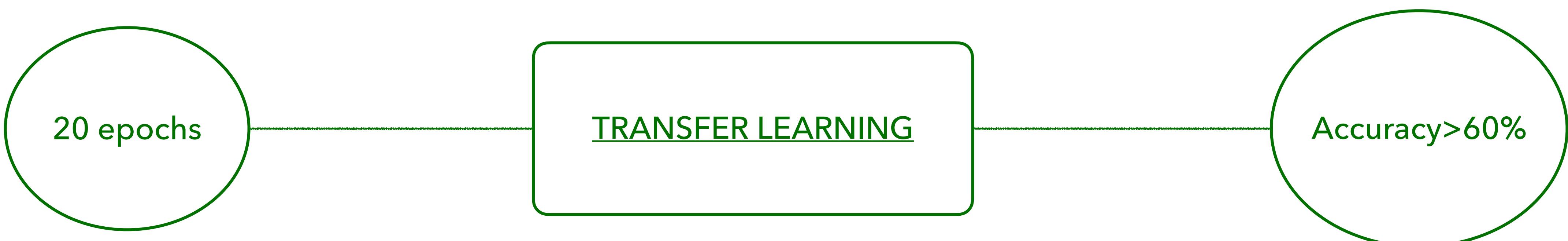
Problèmes rencontrés

Modèles
+50 layers

Loss > 600%
Accuracy < 1%

+1000
epochs
~50h

Solution



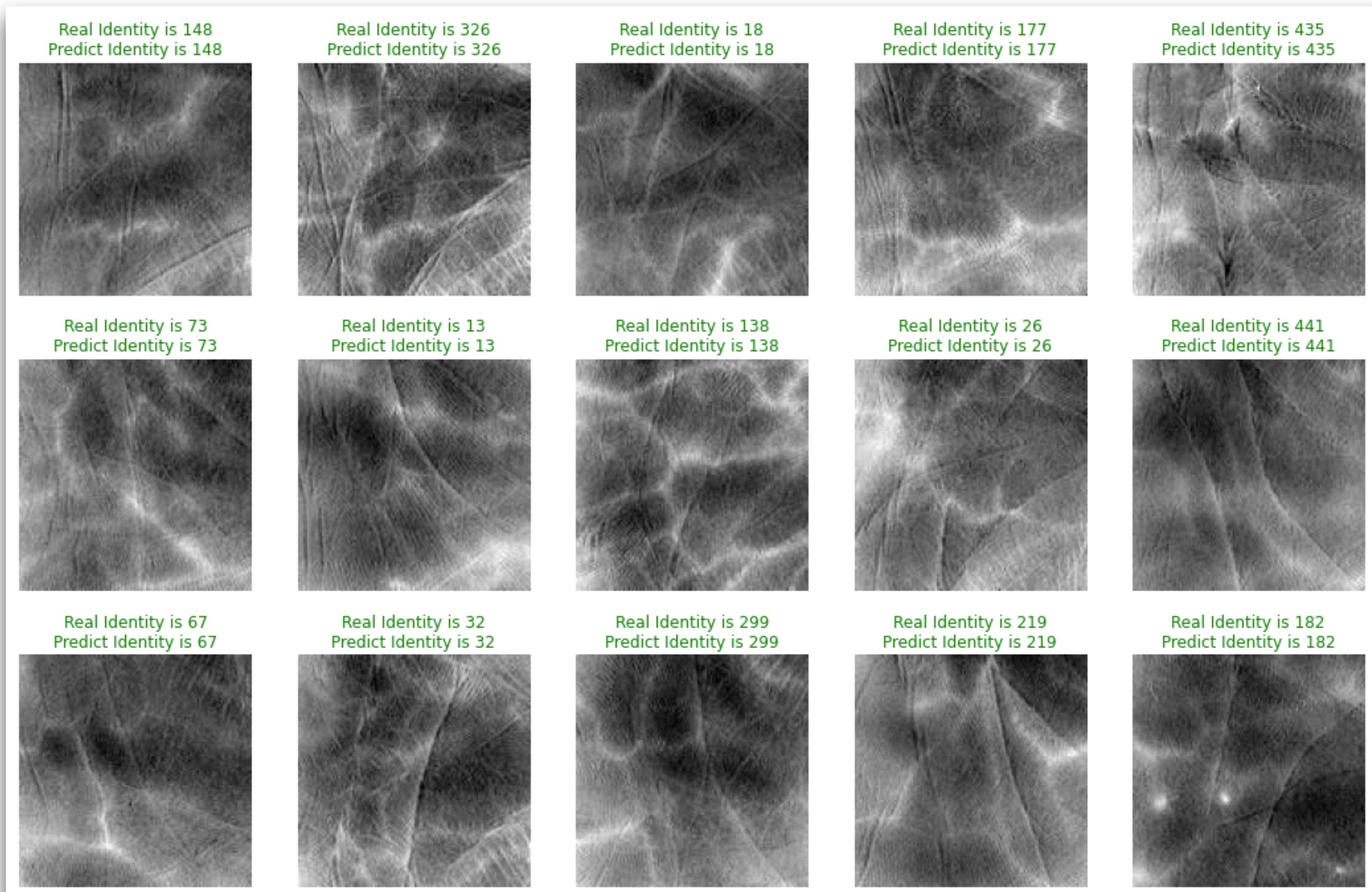
Solution

+500 ~ 2500 epochs
32 ~ 50 batch size
(128,128,1) Input shape
50 ~ 500 classes

20 epochs
32 batch size
(128,128,3) Input shape
500 classes

Models	Sans Transfer Learning (Loss / Accuracy)	Avec Transfer Learning (Loss / Accuracy)
VGG-16	639% 0.10%	629% 0.00%
VGG-19	630% 0.00%	629% 0.00%
ResNet-50	604% 0.15%	0.95% 99.78%
ResNet-150	600% 1.16%	3.16% 99.33%
Inception/ GoogLeNet	610% 0.50%	1.57% 99.89%
Xception	629% 0.11%	107.76% 67.44%
ZFnet	635% 0.00%	X

Solution



Résultat - Semestre 2

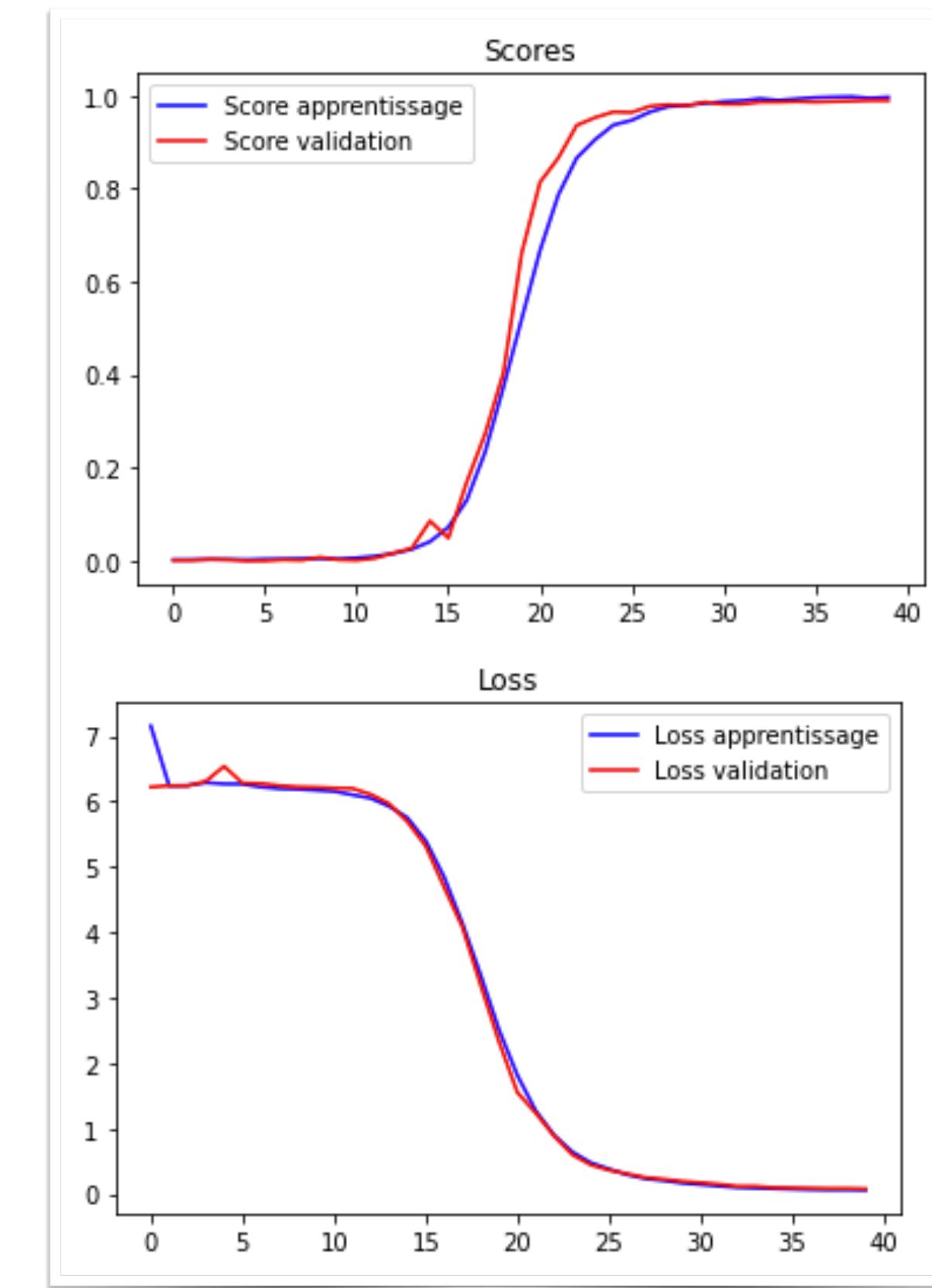
Sans Transfer Learning

Callback « ReduceLROnPlateau »

```
Model: "sequential"

Layer (type)          Output Shape       Param #
=====                ======           =====
conv2d (Conv2D)        (None, 125, 125, 128)    2176
max_pooling2d (MaxPooling2D) (None, 62, 62, 128)    0
dropout (Dropout)      (None, 62, 62, 128)    0
flatten (Flatten)      (None, 492032)        0
dense (Dense)          (None, 128)          62980224
dropout_1 (Dropout)    (None, 128)          0
dense_1 (Dense)        (None, 500)          64500
=====
Total params: 63,046,900
Trainable params: 63,046,900
Non-trainable params: 0
```

Modèle 1 couche



===== Evaluation : 1 layer model =====

Results :

Loss : 0.09
Score : 99.11%

Solution

Callback « ReduceLROnPlateau »

Modèles	Accuracy	Loss	Training duration	params
1 couche	99.11%	0.09	~20 minutes	63 millions
2 couches	96.44%	0.16	36min - 200epochs	~24 millions
ResNet 50	99.22%	0.15	64 minutes	58 millions
ResNet 152	96.11%	1.87	100 minutes	75 millions
EfficientNetB0	99.22%	0.19	34 minutes	14 millions
Xception	99.89%	0.01	40 minutes	37 millions
InceptionResNet	99.67%	0.01	107 minutes	62 millions
DenseNet201	99.00%	0.09	160 minutes	51 millions
NASNetLarge	X	X	X	X

Sommaire

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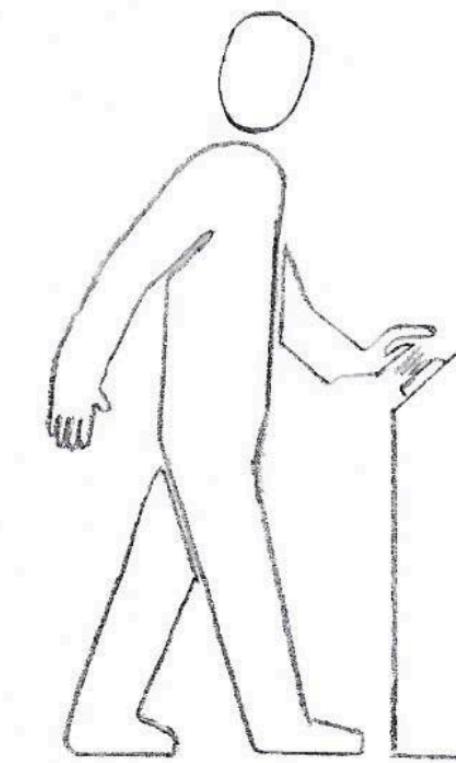
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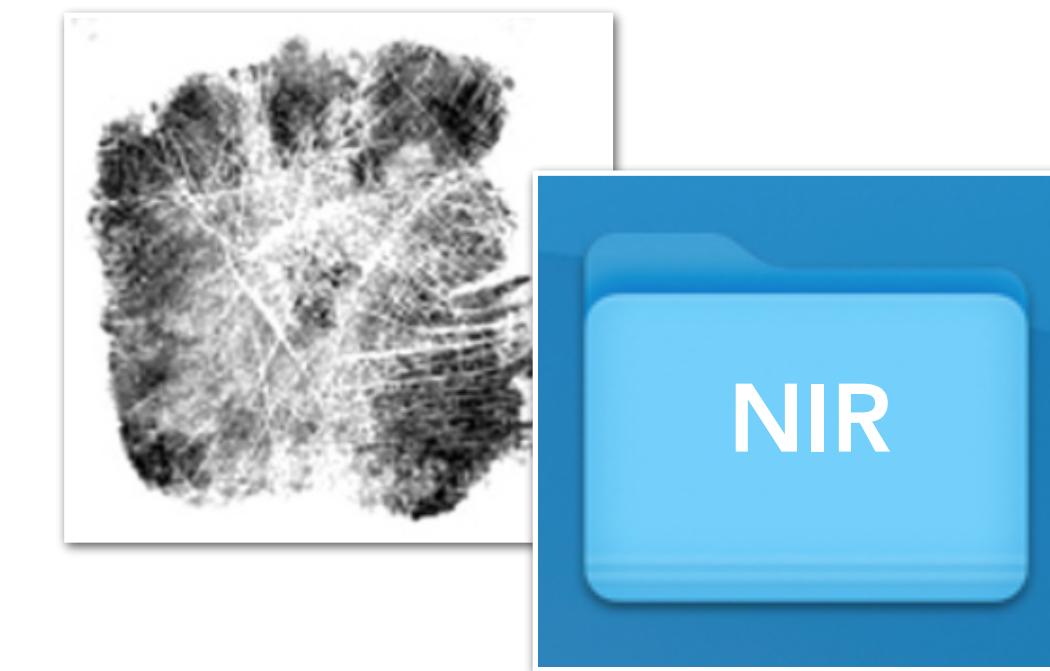
IV. Application

Context and purpose

500 users register and scan
their palm prints



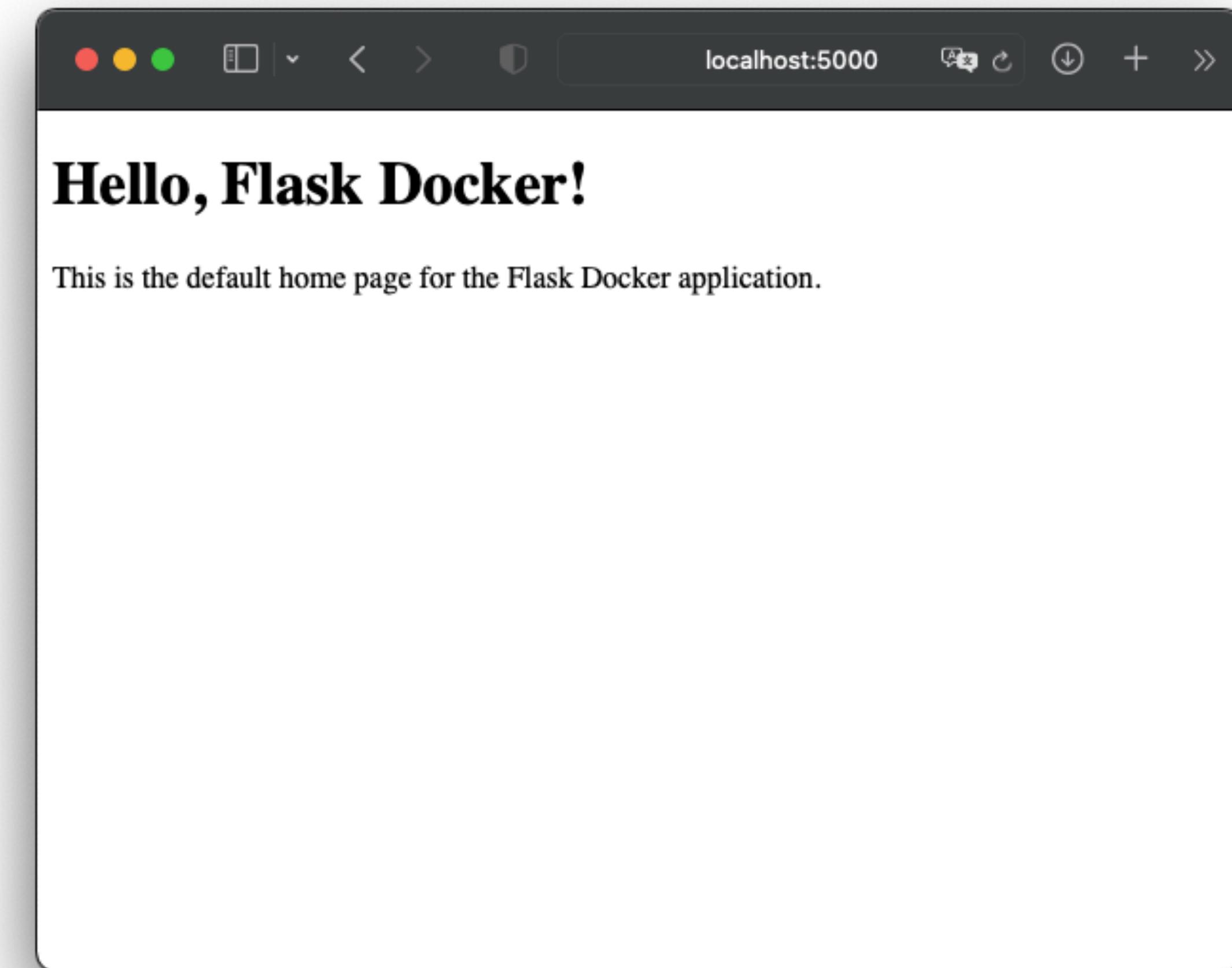
Reception of the NIR
Database: 6000 images



Conception of the palm vein
recognition application

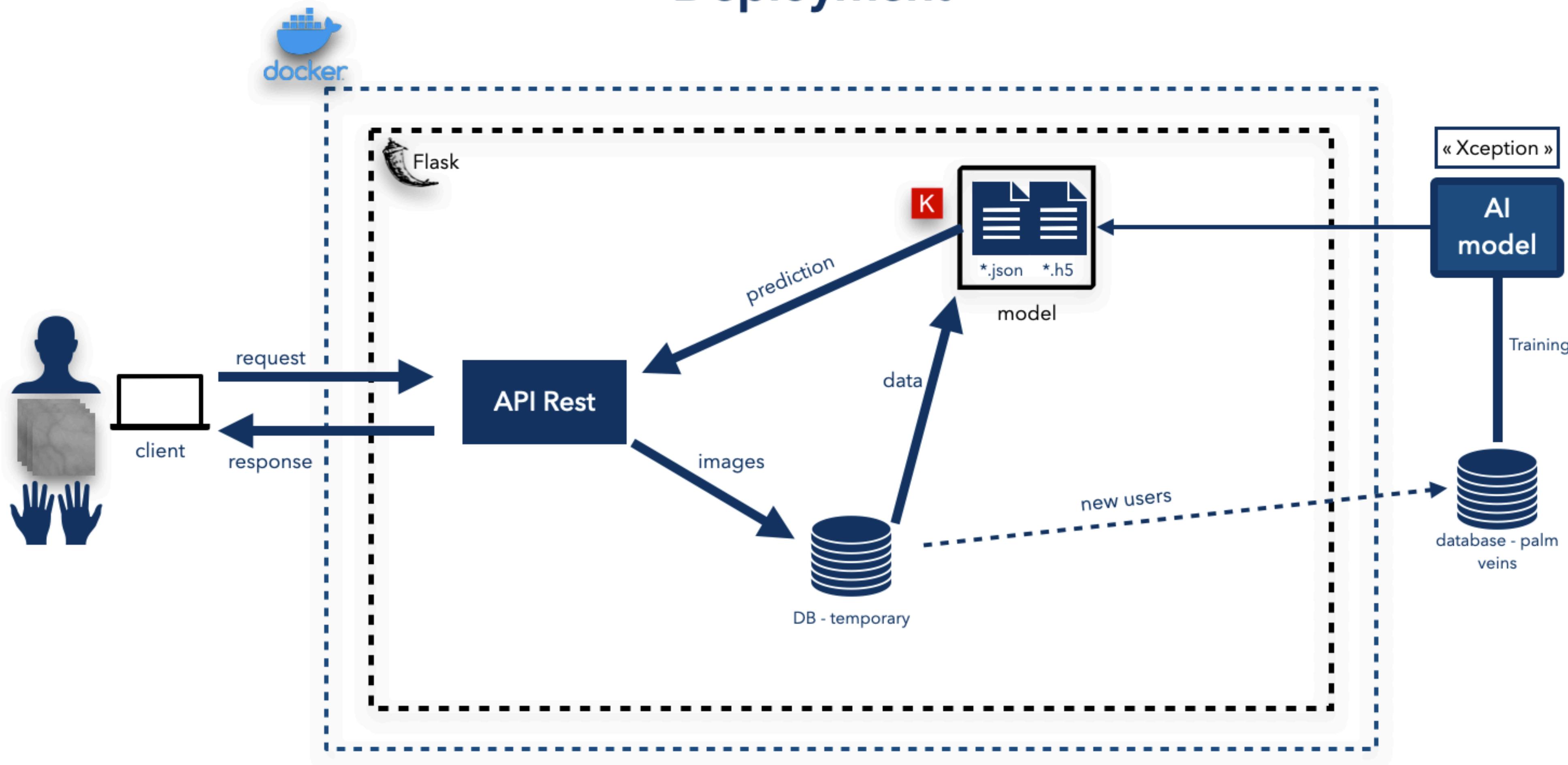


Lancement d'une page Web

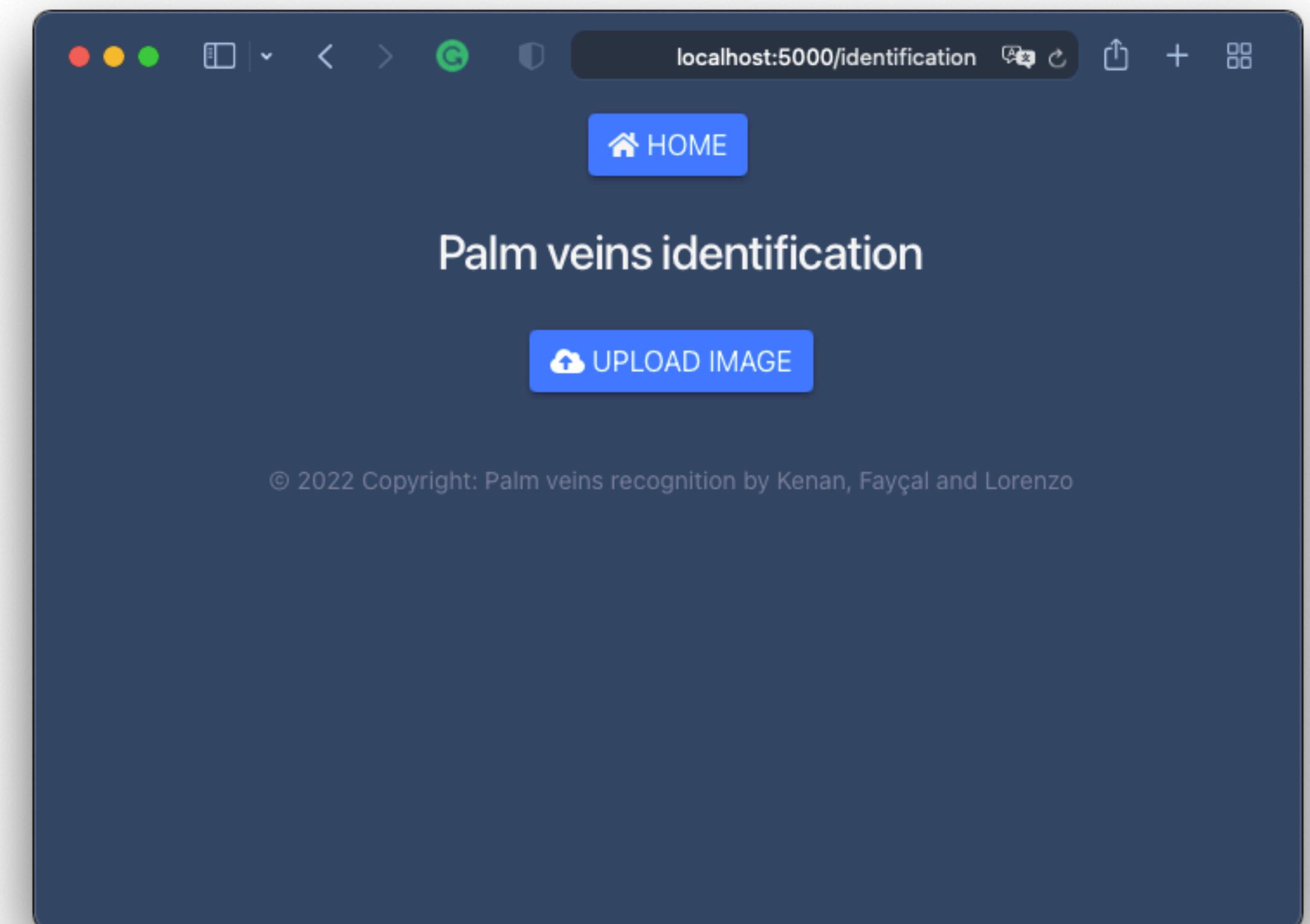
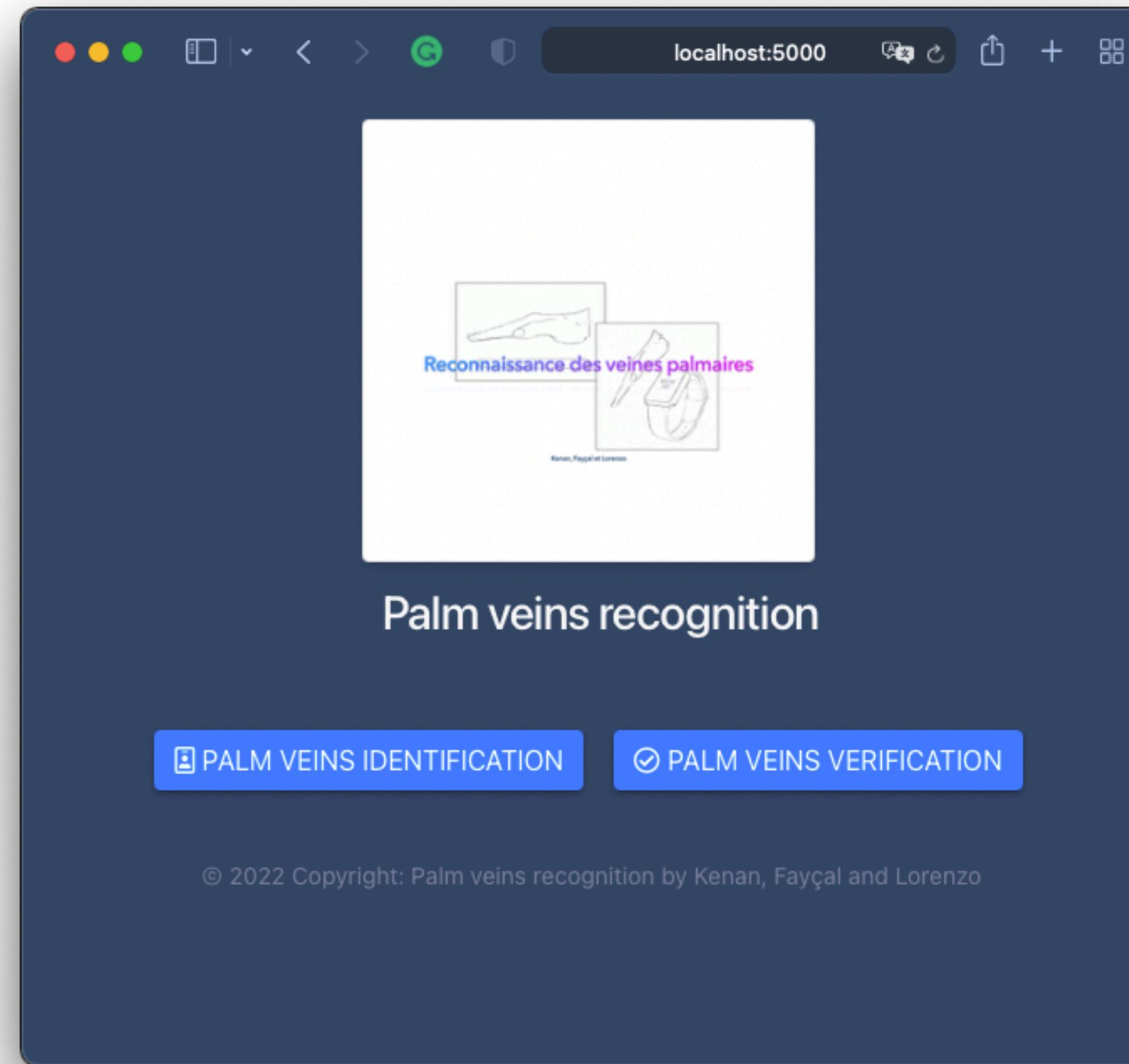


Architecture

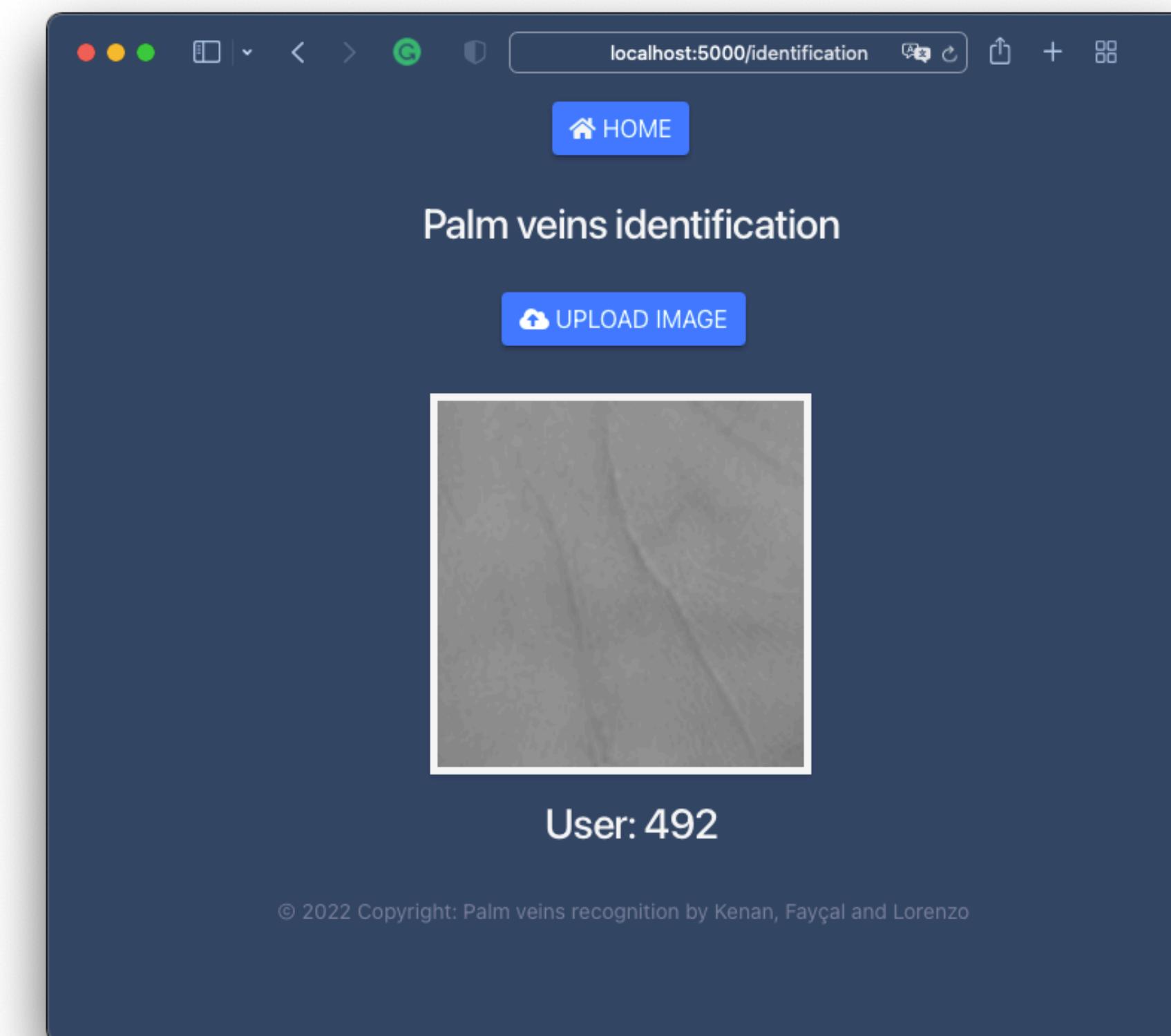
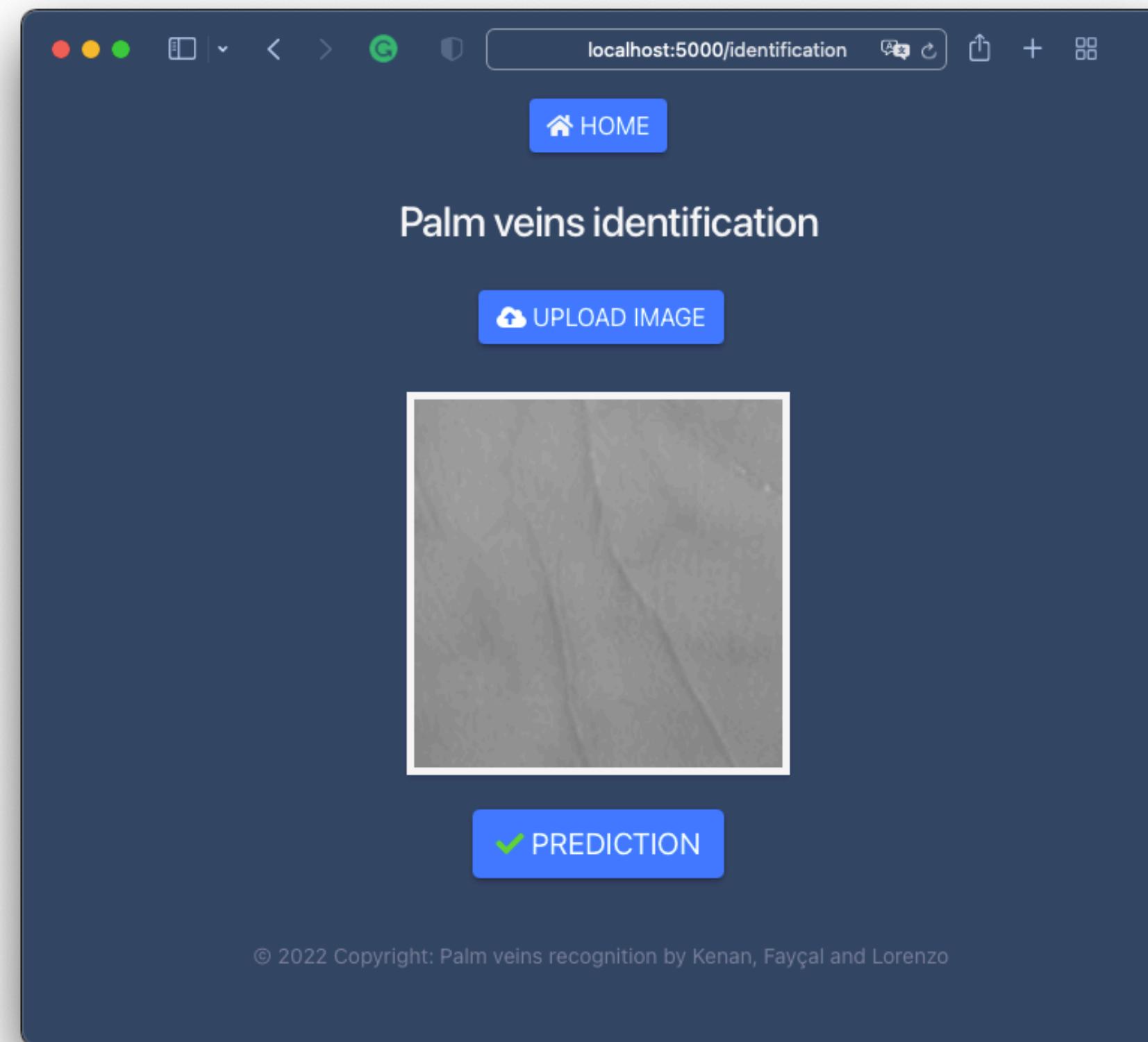
Deployment



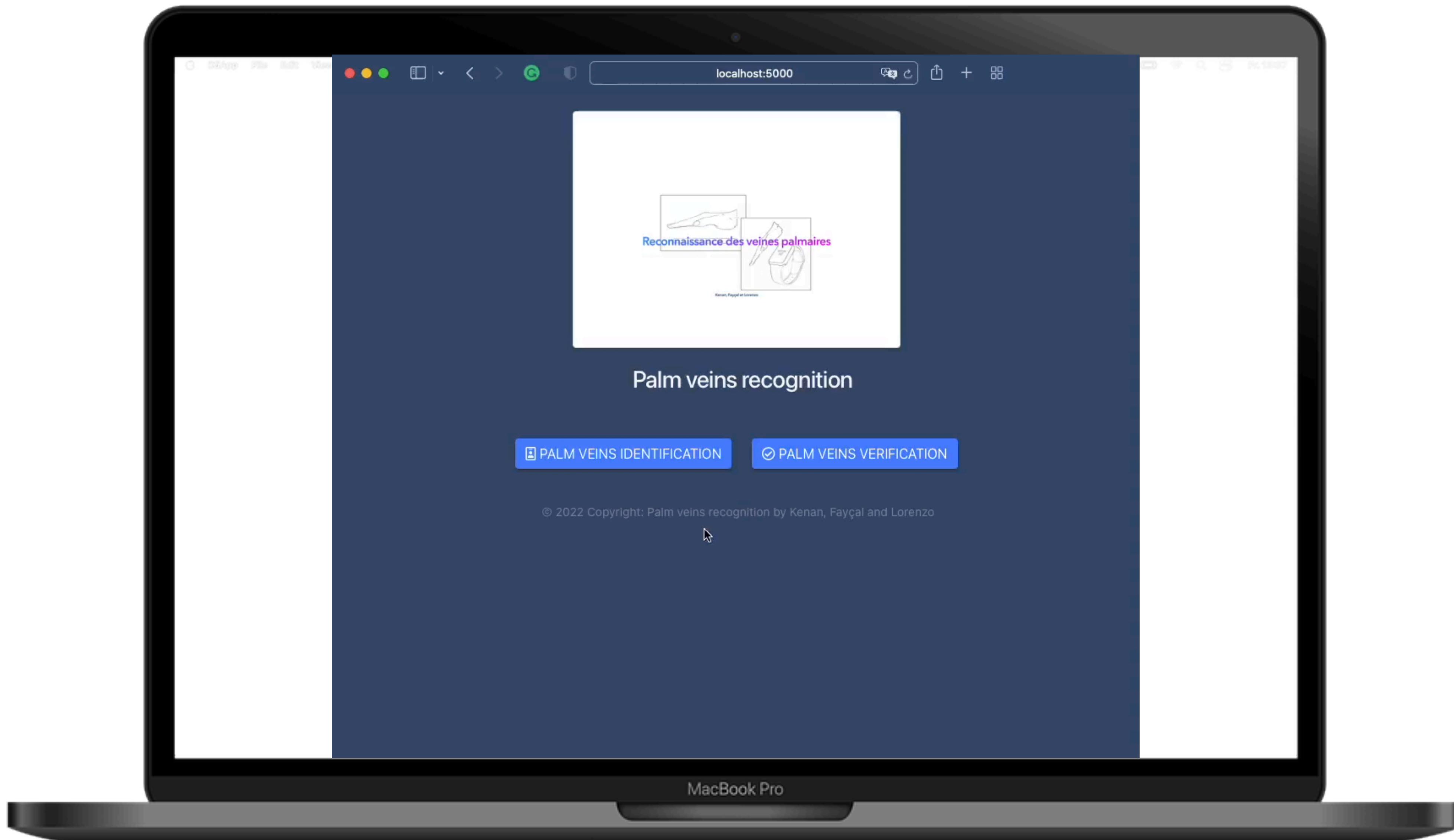
Interfaces



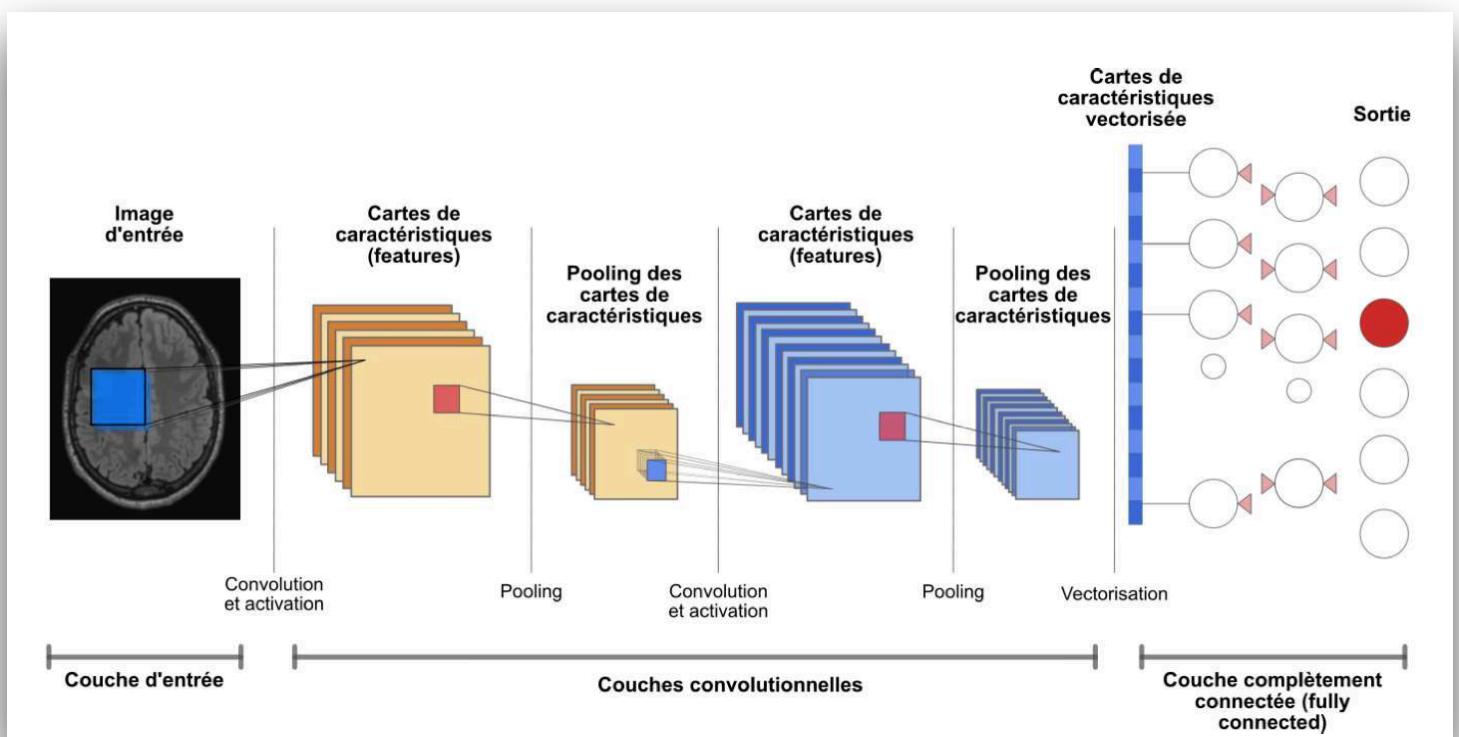
Interfaces



Application

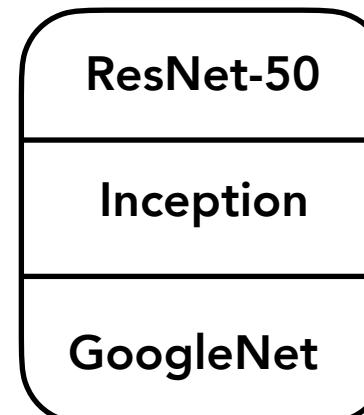


Classification des images avec CNN



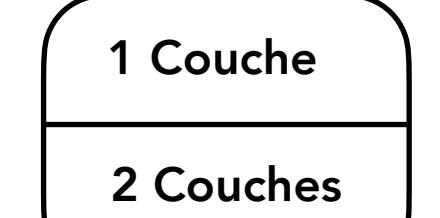
Modèles CNN

Transfer Learning



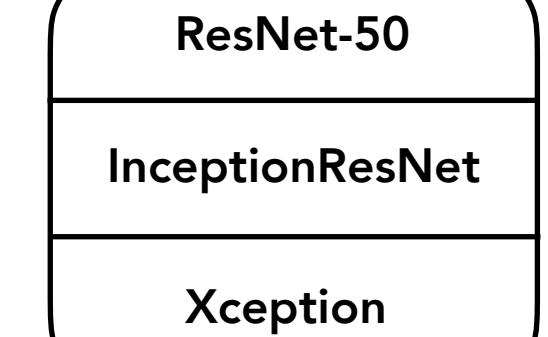
- Loss = 2.36%
- Accuracy = 99.61%

Modèles Simples

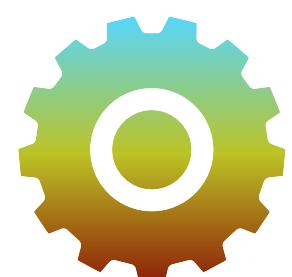


- Loss = 0.13%
- Accuracy = 97.78%

Sans Transfer Learning



- Loss = 0.06%
- Accuracy = 99.59%



Afin d'assurer le bon fonctionnement de l'application B-Hand : nous avons entraîné la NIR Database avec le modèle CNN Xception provenant de Keras.

500 utilisateurs enregistrent et scannent leurs empreintes palmaire



Réception de la NIR Database : 6000 images



Conception de l'application B-Hand



APPLICATION B-HAND

ACCUEIL



IDENTIFICATION

