To a personalized and inclusive anti-ageing experience: leveraging Al-automated assessment of facial signs and their respective weights on human perception

> Dr Frederic FLAMENT, PhD L'OREAL RESEARCH & INNOVATION London Anti-Ageing Skin Care Conference – 2022, November 29th

## UNDERSTAND ALL SKIN DIMENSIONS WITH ENVIRONMENTS & LIFESTYLES



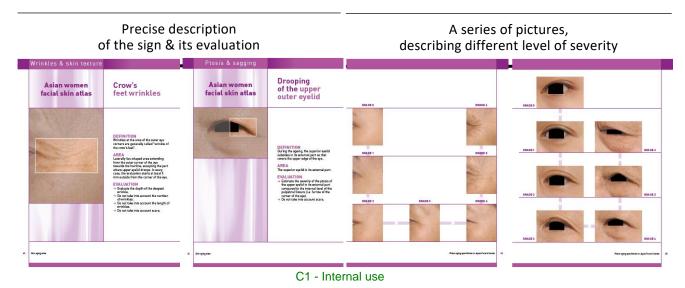
Consumers or clinical researches enter in a new era, benefiting of emergence of personal smartphones with powerful hardware and highresolution cameras. Conducting epidemiological studies on large cohorts, in specific environments/lifestyles, require new embarked automatic grading system to detect and quantify facial signs from selfies.

# Ambition of an inclusive Al-based automatic grading system

### **SKIN AGING ATLAS FOR DERMATOLOGISTS AND EXPERTS**

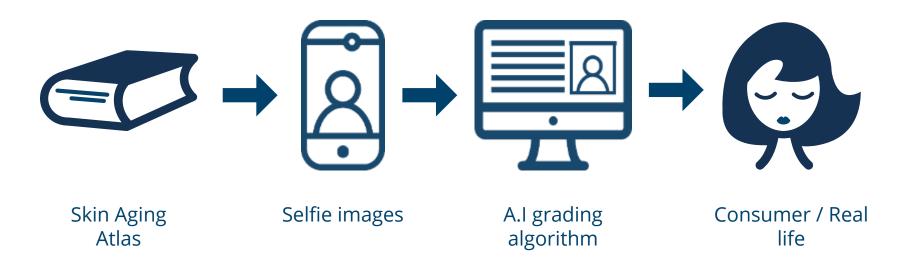
#### Standard clinical photographic scales to bring repeatability and reproducibility





### **BRING NEW CLINICAL DATA TO USERS**

Transform Skin Aging Atlas standards and associated knowledge

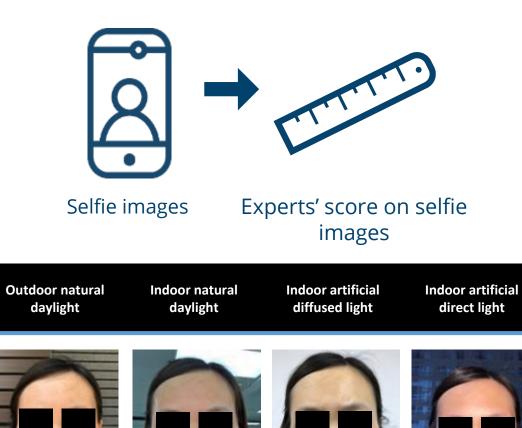


# Creation of an inclusive AI-based automatic grading system

#### **LEARNING DATABASE**

Selection of graded images covering diversity of usage

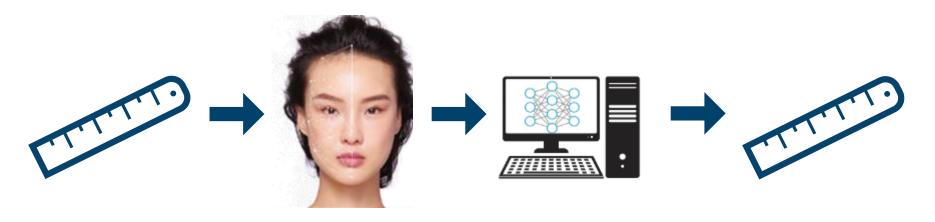
- 15,000 images of both gender
- 4 lighting conditions
- Photo-types I-VI
- 15 experts/dermatologists
- 15 facial signs on selfies





### **PROCESS OF TRAINING FOR A.I GRADING ALGORITHM**

Supervised learning based on clinical scores from Skin Aging Atlas



REAL Skin Aging Atlas score by experts/dermatologis ts Image pixels analysis Supervised regression within deep learning framework / CNN

PREDICTED Skin Aging Atlas score by selfie images analysis

### **ACCURACY AND ROBUSTNESS OF PREDICTION**

How efficient is prediction of Skin Aging Atlas scores on real life selfies?

- 1,500 men & women (20–75y)
- Photo-types I to VI (7 countries)
- 15 experts/dermatologists
- 15 facial signs on selfies
- 2 scientific publications



Exprets' grading

Selfie images Predict grading



	Facial signs	A.I Error	Experts Error	Facial signs	Variability
	Wrinkles	0.30	0.60	Wrinkles	12 %
	Sagging	0.25	0.55	Sagging	10 %
)	Pigmentation	0.40	0.65	55 Pigmentation	11 %
- 8	Vascular	0.22	0.50	Vascular	10 %
	Cheek pores	0.30	0.55	Cheek pores	11 %

## HIGHER ACCURACY FOR ALGORITHM VS. EXPERTS'. ROBUST VS. EXPRESSIONS, POSITIONS, DISTANCE OR LIGHT.

## Validation of accuracy and relevance of an inclusive Al-based automatic grading system

#### **VALIDATION BY DERMATOLOGISTS**

Prediction of live grading with selfies analysis

- 579 women (20–75y)
- 10 dermatologists
- 5 cities in Europe & Asia
- 15 facial signs on selfies
- 3 scientific publications



Live derlatologist Selfie images Selfie image graded by Predict grading A.I

Facial signs	Correlation	Significance
Wrinkles	r = 0.90	p < 0.0001
Sagging	r = 0.90	p < 0.0001
Pigmentation	r = 0.70	p < 0.0001
Vascular	r = 0.80	p < 0.0001
Cheek pores	r = 0.60	p < 0.001

A.I GRADING HICHLY-CORRELATED WITH ASSESSMENTS BY DERMATOLOGISTS FOR VERY PREDICTIVE SCORES.

### **DIVERSITY & INCLUSIVITY**

Unique study in US to demonstrate accuracy of A.I-based automated grading system

- 1,041 US women (20–80y)
- All phototypes, ancestries, ages
- Northeast, Midwest, South, West
- 7 facial signs on selfies
- 50 Dermatologists with diversity



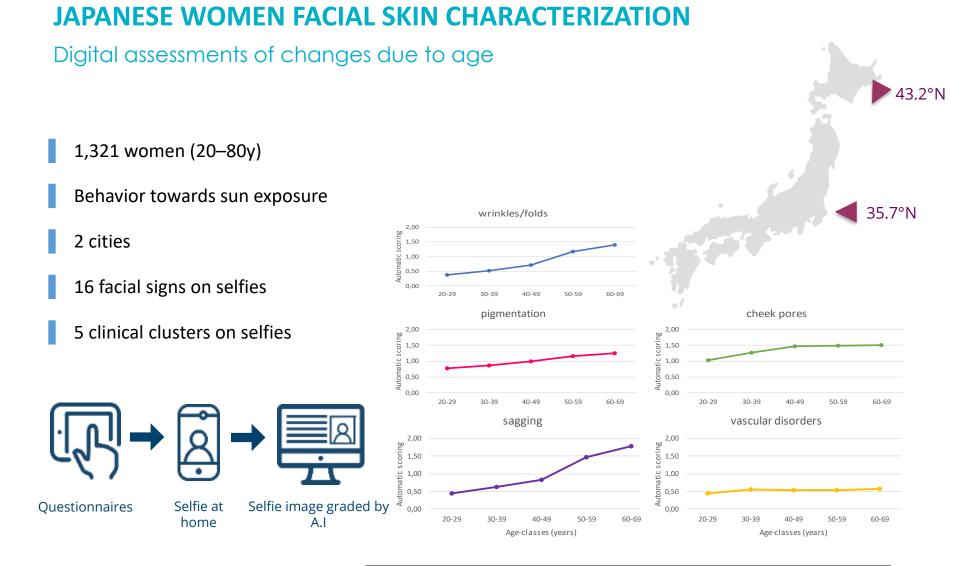
Exprets' grading

Selfie images Predict grading

	Sub-groups	N	Forehead wrinkles	Periorbital wrinkles	Nasolabial fold	Density of pigmentary spots	Ptosis Iower face	Diffused redness	Cheek pores	Average	
	Global panel	1,041	0.83	0.79	0.90	0.40	0.91	0.79	0.63	0.75	
	Non-Hispanic Euro-American	313	0.87	0.86	0.91	0.62	0.92	0.78	0.63	0.80	
	African American	280	0.86	0.76	0.90	0.28	0.89	NA	0.64	0.72	
	Hispanic Euro-American	253	0.86	0.85	0.89	0.33	0.90	0.80	0.69	0.74	
	East Asian	195	0.89	0.84	0.92	0.26	0.92	0.65	0.69	0.76	
	18y–29y	249	0.69	0.61	0.71	0.37	0.66	0.80	0.58	0.63	
	30y–39y	245	0.77	0.69	0.79	0.37	0.75	0.78	0.69	0.69	
	40y–49y	223	0.78	0.67	0.80	0.49	0.73	0.78	0.60	0.69	
	50y–64y	196	0.79	0.70	0.80	0.56	0.79	0.77	0.50	0.70	
	65y –80y	128	0.73	0.60	0.77	0.53	0.72	0.76	0.45	0.65	
	Phototype I	77	0.88	0.88	0.89	0.57	0.91	0.84	0.64	0.80	
	Phototype II	216	0.83	0.83	0.90	0.46	0.92	0.70	0.59	0.75	
	Phototype III	294	0.83	0.78	0.90	0.43	0.91	0.79	0.60	0.75	
	Phototype IV	259	0.83	0.73	0.92	0.43	0.92	0.80	0.68	0.76	
g	Phototype V	138	0.78	0.71	0.86	0.16	0.82	0.76	0.69	0.68	
	Phototype VI	57	0.68	0.59	0.87	0.17	0.82	NA	0.66	0.63	

IN THIS "INCLUSIVE" STUDY A.I PERFORMED WELL VERSUS DERMATOLOGISTS GRADINGS IMPROVEMENTS NEEDED IN PIGMENTATION, PHOTOTYPE VI, AND YOUNGER/OLDER

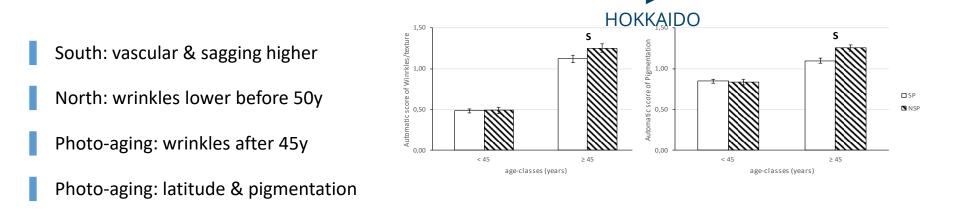
## Use of an inclusive Al-based automatic grading system for knowledge purposes



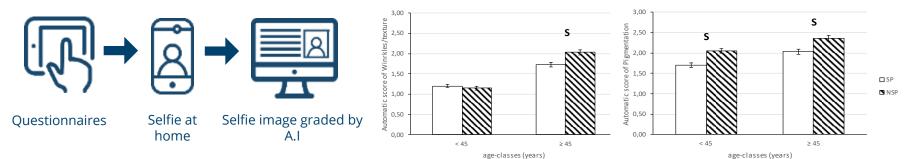
DIGITAL TYPOLOGIES: AT HOME CHARACTERIZATION OF FACIAL SKIN AGING IN JAPANESE WOMEN.

#### JAPANESE WOMEN FACIAL SKIN PHOTO-AGING

Selfie images characterization of sun exposures and latitude impacts



► TOKYO



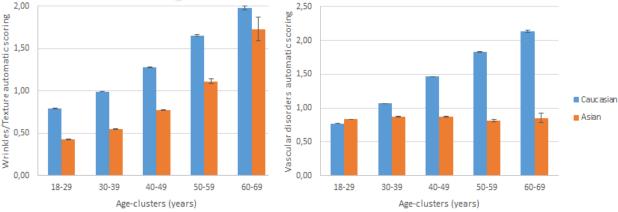
DIGITAL TYPOLOGIES: LIFESTYLES, ENVIRONMENTS AND LATITUDE IMPACT SIGNIFICANTLY JAPANESE SKIN.

### **SKIN AGING PROCESS ON LARGE SCALE**

More than half a million individuals with European or East-Asian origins

544,603 women (18–75y) European & East-Asian cohorts 5 clinical clusters on selfies Specificities in skin aging





DIGITAL EPIDEMIOLOGY: QUANTIFICATION OF FACIAL SIGNS WITH AGES, ENVIRONMENTS AND LIFESTYLES.

## Use of an inclusive Al-based automatic grading system to assess performance

### **QUANTIFY EFFICACY AFTER ONE MONTH APPLICATION**

Digital consumer/clinical study on one thousand Chinese women

- 1,064 women (20–60y)
- 8 cities across China
- 16 facial signs on selfies
- Self-assessments
- Virtual clinical sub-cohorts





Daily application at home

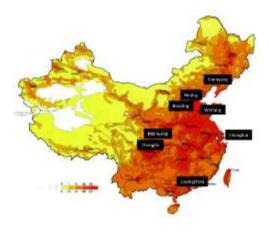


D28



Selfie image graded by A.I





## DIGITAL EFFICACY STUDIES: REAL USERS IN REAL LIFE FOR MORE SINCERE & INNOVATIVE CLAIMS.

# Scientific support and endorsment of an inclusive AI-based automatic grading system

#### **VALIDATED & PUBLISHED WITH DERMATOLOGISTS**

11 papers accepted & 3 submitted

Cosmetic Science	International Journal of Cosmetic Science	International Journal of Cosmetic Science	Received: 26 July 2020 Revised: 30 September 2020 Accepted: 2 October 2020 DOI: 10.1111/wrt.12992		Received: 5 November 2020 Accepted: 11 March 2021 D0E:01111/srt:10037		Received: 19 January 2021 Accepted: 20 April 2021 DOI: 10.1111/ort.12061		Received: 4 October 2021 Accepted: 9 March 2022 D0k: 10.1111.ket.13153		Received: 1 June 2020 Accepted: 20 June 2020		DCR 10.1111/dv 18073
utional Journal of Cosmetic Science, 2019, 41, 67-78	International Journal of Cosmetic Science, 2019, 41, 472–478	International Journal of Cosmetic Science, 2020. 42, 185-197	ORIGINAL ARTICLE		ORIGINAL ARTICLE		ORIGINAL ARTICLE		ORIGINAL ARTICLE				ener til er er og var ener se
new procedure, free from human assessment	An automatic procedure that grades some	A new procedure, free from human ass									ORIGINAL ARTICLE		ORIGINAL ARTICLE
ades some facial skin structural signs. Comp	signs: agreements and validation with clir	grades some facial skin signs in men f	Japanese experime	ont of a complete	Comparing the sel	f-nerceived effect	Developing on Ar	tificial Intelligence (A.I	Objective and exte	mentio and income			Artificial Intelligence analysis of over half a million European
sessments by experts, using referential atlas	by dermatologists	Application to changes induced by a se			product to those a					omatic grading syste		evelopment of a comple	and Chinese women reveals striking differences in the
eei Jiang", kina Kezele", Alex Levinshtein", Frederic Flament 🎧, Jingvi Zhang", Eric Hinomi	E Flament" 🚯 M. Holmann <sup>1,2</sup> , E. Roo <sup>l,</sup> C. Raimbault-Genard <sup>6</sup> , B. Chuberre <sup>44</sup> , Y. Zh	pollution	grading system of					that fits with the asse		outh African womer	automatic grading	system of facial signs f	facial skin ageing process
e Coquide <sup>1</sup> , Vincent Arcir <sup>1</sup> , Esohe Omoyuri <sup>1</sup> and Parham Azrabi <sup>*</sup> Face - A L'Oréal Group Company, Toronto, Ganada, <sup>1</sup> L'Oréal Research and Innovation, Clichy, Pr	J. Coguide <sup>11</sup> , V. Arcin <sup>12</sup> and P. Aurabi <sup>11</sup>	Y. Zhang", R. Jiang", I. Kerde", F. Hanners" (D. E. Elmanino", J. Zhang", C. Ye	with dermatologis		Chinese women of	r different ages an	experts		changes with age a	ind sun-exposures	Asian validation s	tudy and application to	F. Flament, <sup>1,a</sup> () L. Jacquet, <sup>2</sup> C. Ye, <sup>3</sup> D. Amar, <sup>3</sup> D. Kerob, <sup>2</sup> R. Jiang, <sup>4</sup> Y. Zhang, <sup>4</sup> C. Kroely, <sup>5</sup> C. Delaunay, <sup>1</sup>
xy, Clidhy, Pranor	*COréal Reserch and Innovation, 9 Rue Pierre Droyfas, 92110, Clichy, France, Thermatole Maticine University, Chartiefaith 1,10115, Revin, Germany, Toppartment of Dermatology, 1 Dermatologier Consultance Practice, Radio Calvo 22, 20010. Maddin, Sanih, "Private Dermat	<ol> <li>Zhangy, H., Jungy, L. Kenner, F. Hamener, M. Kamonnov, J. Zhangy, C. He V. Archin<sup>3</sup> and P. Aarabi<sup>4</sup> "Modelase - A Utofal Group Company. Toronto. Canada. <sup>3</sup>UOrial Research and Ire</li> </ol>	and sun exposures	5	Frederic Flament <sup>1</sup> O				Frederic Flament <sup>1</sup>   Yuze	Zhang <sup>2</sup>   Ruowei Jiang <sup>2</sup>	ethnic origins, diff	erently aged	T. Passeron <sup>6,7</sup>
eived 23 October 2018, Accepted 11 January 2019	Meta, Prance, "Active Cosmetics International, Global Medical Relations and Communicatio Prance, "ModiFies – A L'Oréal Group Company, 7 St, Thomas S, Suite S02-504, Theorem,	Shanghat, China and <sup>8</sup> L'Oréal (DO – Digital Service Factory, Clichy, France			Sarah Dubosc <sup>4</sup>   Maxime			uze Zhang <sup>2</sup>   Zhi Yu <sup>2</sup>   Ruowei 'incent Arcin <sup>3</sup>   Raia Daniel <sup>4</sup>	Matthieu Cassier <sup>1</sup>   Caro	line Delaunay <sup>1</sup>   Guive Bak			<sup>2</sup> Victy International, Lavalicie-Permit, Prance
wordst automatic scoring system, clinical research, facial clinical signs, skin ageing atlas	Service Factory, 41 Rae Marter, 92117. Clichy, France	Received 14 January 2020, Accepted 18 January 2020	Frederic Flament <sup>1</sup> Da		Maxime De Boni <sup>2</sup>   Caroli			'incent Arcin <sup>o</sup>   Raja Daniel <sup>o</sup>   . Movano <sup>5</sup>   Audrey Thenin <sup>6</sup>   M			Frederic Flament <sup>1</sup>   Ya	ang Won Lee <sup>2</sup>   Dong Hun Lee <sup>3</sup>	<sup>1</sup> L'Oréel Research and Innovation, Shanghoi, China "ModiFece – A.L'Oréel Group Company, Toronto, Canada
	Received 18 April 2019, Accepted 25 June 2019	Keywords: artificial intelligence, automatic grading system, chronic pollution exposures,	Emilie Yokoyama <sup>2</sup>   Ayako Aurelie Abric <sup>4</sup>   Aya Naka			, runnin,		im Chibout <sup>1</sup>   Xavier Blin <sup>1</sup>   Cau	12/Detail Research and Invocation, Clicky, Research	Abstract		ang <sup>6</sup>   Anne Prunel <sup>7,8</sup>   Seema E	<sup>1</sup> 1: Crivial 2000 – Digital Service Factory, Cloty, France <sup>1</sup> Department of Dematology, Université Céte d'Apur, CHU Nos, Nos, France
stract mième quantile immé	Keywords: automatic scoring system, dinical research, dormatologist subdation, factal dinical si		Aurelie Abric <sup>*</sup>   Aya Naka Matthieu Cassier <sup>2</sup>   Carol		<sup>1</sup> COreal Research and Innovation, Clichy,	Abstract	A white properties Produining 1 Juli	an choose   Mayer billi   Cal	<sup>4</sup> ModFate -AL: Ordal Group Company.	Objective: To evaluate the capacity	Youn Jung Park <sup>10</sup>   Bertr	and Chuberre <sup>11</sup>   Parham Aarabi <sup>4</sup>	<sup>1</sup> Université Cote d'Azur, NSEFIN, U1005, CBM, Noe, Ferror Tommpondence, F. Farrert, E-mail: holen:://armentilet.lonwi.com
CTUVE: To develop an automatic system that grades the selon l'ethnic déclarée p ity of facial signs through 'selles' pictures taken by women of ceax de 12 experts et d			matulieu cassier*   Carol	inte Delaunay 12	France <sup>9</sup> COvéal Research and Innovation, Shanghai,	Objective: To assess the agree	<sup>3</sup> COvial Research and Innovation, Clichy,	Abstract	Tammo, Ontario, Canada <sup>14</sup> Euronas, Wildon-sar-Wetter, France	grade, from smartphones' selfie pic			
rent ages and ethnica. HIGDS: 1140 women from three ethnics (African-American, RÉSULTATS) Le système		Abstract CONC OBJECTIVE: These were two folds: at first, to develop an auto- autom	*COreal Research and Innovation, Clichy,		China <sup>I</sup> ModiFace, A L'Oréal Group Company,	ficient anti-aging product, bet	Prance <sup>9</sup> ModiFace - A L'Oreal Group Company.	Objective: To develop an A.I-based a	<sup>4</sup> L'Orbal CDO-Digital Service Factory, Clicky,	African women and their changes re	<sup>3</sup> COréal Research and Innovation, Clichy, France	Abstract	Abstract Background Artificial Intelligence (A.II and deep learning-based algorithms are increasingly being used in dematology
n, Cascasian), of different ages (18-80 years old), took 'selles' ditions d'échairage et les high resolutions smartphones cameras under different conditions de l'ordre de 10-13'	Abstract visage à parti OBJECTIVE: To confirm the robusiness and validity of an auto-	matic grading system specifically dedicated to some facial signs of formed men, similar to the one previously validated on women of different agreen	France <sup>3</sup> L'Oréal Research and Innovation, Tokyo,	Abstract Objective: To evaluate the ca	Toronto, ON, Canada	detected and graded by an au	Toronto, ON, Canada <sup>12</sup> Dorial CDO - Digital Service Factory.	from selfie pictures, 23 facial signs, hair	Frania	Methods: A two-steps approach w At first, to assess on 306 South	<sup>3</sup> Department of Dermatology, Konkuk University School of Medicine, Seoul, Korea	Objective: To evaluate the capacity of th	following the emergence of powerful smartphones with high-resolution cameras.
ighting or facial expressions. A dedicated software, was devel- de band on a Corrobational Neural Network (CNN) that inte- or take calls.	matic scoring system, algorithm-based, that grades the severity of MÉTHODES: nine facial signs through "selles" smartphones pictures taken by Ørance, Alle	effortic ancestry and second, to assess its potential in detecting and this a grading the possible impacts of a severe serial urban pollution on approx	Japan	grade, from smartphones' sel	<sup>4</sup> Lancôme International, Levallois-Perret, France	Material and Methods: OF 10:	Clichy, France	Material and Methods: The selfie imag	Correspondence Feederic Flammen, \'Oreal Research and	toria area (25.74°S, 28.22°E), age	Department of Dermatology, Seoul	grade, from smartphones' selfle pictures, to the nine previously integrated.	Objectives To use an AJ-based algorithm, validated by dematologists, to compare the evolution of the skin ageing process among Chinese and European women.
in training data from referential Stin Aging Alases. The latter CONCLISION: Co systi we to an immediate examilication of the averity of nine facial divelopment. semble	European Caucasian women through dermatological assessments. pris un « sell METHODS: 157 Caucasian women from three countries (France, que le derm	some fodal signs of Chinese men. METHODS: In both studies, sellie images were obtained from dif-	<sup>3</sup> ModiFace - A L'Oréal Group Company, Toronto, Canada	women and their changes due	<sup>6</sup> Eurosyn, Villebon-sur-Yvette, France	ferent Chinese cities were recr	<sup>4</sup> ARMANI International, Levallois, France <sup>9</sup> LANCOME International, Levallois, France	women and men were used to create ( a new algorithm architecture to aporal	Innewation, 9 Rus Pierre Derpha, 92130, Clicks, France.	artificial intelligence (Al)-based au	National University College of Medicine, Seoul, Korea	Methods: A two-step approach was cond	Methods: Selfe images were taken by 465 587 European and 79 016 Chinese wonten ranging from 18 to 85 and 18 to
according to the ethnicity declared by the subject. These description quantitative : matic grading were conferented to those assessed by 12 trained harmain, dans de nombe	Germany, Spain), of different ages (20-75 years), took one "sellie" caméra donsa image by the frontal camera of their smartphones whereas local par le systèr	ferently aged men. Nine facial signs were automatically graded OBJEX through a specific A.I-based algorithm and clinically assessed by a	*Eurosyn, Villebon-sur-Yvette, France *Department of Geriatric and Environmental	Methods: A three-step appro At first, to check on 310 Jap	Correspondence Flament Frederic, L'Oreal Research and	referential anti-aging product of subjects at D <sub>D</sub> and D <sub>DB</sub> and service	*Coreal Operations - Innovation Packaging, Levallois, France		Drugh it was a flamonight loveral com	experts/dermatologists. Second, an according to their usual behavior to	<sup>4</sup> Department of Dermatology, CHU Nice, University Côte d'Azur, Nice, France	how the Al-based automatic grading sys	69 years old, respectively, without fadial skin diseases and who had access to a smartphone with a high-resolution cam- ara (>4 Magapixels). The softes were analysed by facial skin diagnostic using a smartphone application to grade the
mate grading wire'e contracted to those assessed by 12 trained internation, dans de nomor erts and dermatologists either on 'sellien' pictures or in live con- es on a smaller cohert of women. I taines attractigne médicale	demnatologists photographed them with the back camera of the évalués par t same smartphone. The same nine facial signs of these subjects were tids du vidi	panel of experts and dermatologists. Sellle pictures were taken from individual smartphones of variable optical properties. The first	Dermatology, Nagoya City University Graduate School of Medical Sciences,	Hokkaido area (latitude 43.2	Innovation, 9 Rue Pierre Dreyfus, 92110, Clichy, France,	ent facial signs. At D <sub>28</sub> and service	Correspondence	ists. Each selfie image was annotated I	Funding information L'Ontal Research and Innovation Department	N = 151) and sun-phobic (SP, N = 1	<sup>5</sup> INSERM U2065, C3M, University Côte d'Agus, Nice, France	sessments, taken as reference; second, t tries (African, Asian, and Caucasian) the	sevently of 9 facial signs (including writikes, sagging, vascular, pigmentation signs, pores). Results: Winkles/Insture, ptosis and sagging increased linearly with age in European women compared to lower
CLTS: The system appears weakly influenced by lighting con- nor facial expressions (coefficients of variations ranging 10-	initially graded by these local dermatologists, using referential Skin ensuite analy Aging Atlases, All 314 "selfies" images were then further automati- des neuf sign	study, designed for developing an automatic grading system, different involved three comparable cohorts of men from three different et life	Nagoya, Japan	grading system may correlate	Email: frederic flament@rd.loreal.com	their faces, through six general	Frederic Flament, L'Oreal Research and Innovation, 9 Rue Pierre Drevfus, 92110.	Artificial Intelligence (A.I)-based algorit Results: As some the 23 signs present	CONE HILITS IN TRACTOS DIE THAT	photo-protective product, to charac	ModiFace - A L'Oréal Group Company.	Results: The sixteen specific Asian facia	scores and more gradual increase in the younger age-classes in Chinese women. In Chinese women, pigmentation signs
6 for most signs) and leads to global agreements with experts' Introduction	cally analyzed by the algorithm. The severity of facial signs (wrin- kles, pigmentation, plosis, skin folds etc.) were shatistically commeréfére	regional ancestries (African, Asian, Caucasian, 110 each) the selfe unbasi images of which were acquired under four different lighting condi-	Correspondence Frederic Flament, L'Oreal Research and	Second, to assess and compar Third, as these Japanese pan	Funding information All costings of the precent work were	Results: A global agreement	Clicky, France. Email: frederic flamenbilind.long.com	were analyzed by two different statist		Results: (1) The automatic scores sh	Terento, ON, Canada <sup>7</sup> L'Oréal Research and Innovation, Tokyo,	significantly (P < .0001) highly correlate	increased regularly between 18 and 40 years, plateaued between 40 and 60 years, then increased in the over 60s com- paned to lower scores and a slower more regular increase with age in European women. Vascularization signs increased
5. first and for the first one	compared to the assessments made by the three dermatologists, RESULTATS: taken as ground truth. $(P < 0.001)$ c	tions. As a second use case study, the facial signs of two othorts of Chinese men (101 and 100, each), differently aged, regularly	Innovation, 9 Rue Pierre Dreyfus, 92110,	toward sun exposure, that is	entirely met by L'Ordal Group	among women older than 40 y pronounced or among younger	-	automatic descriptor system were not		sagging and wrinkles/texture (p < 0. tion clusterscores presented no sign	Japan <sup>6</sup> L'Oréal Korean Innovation Center, Seoul,	Korean dermatologists (wrinkles: r = .90;	steadily with age in European women compared to no significant change in Chinase women.
CLUSION: This automatic scoring system, still in develop- seems offering a new quantitative approach in the quantiled liferive factors (specin	RESULTS: Highly significant coefficients of correlation ( $P < 0.001$ ) fournis par le were found in the three cohorts between the grades provided by gues des visu	esposed to very different aerial urban pollution conditions (UP) special speci	Clichy, France. Email: frederic.flament@rd.loreal.com	N = 196), and through their r		one grading units. This limit be	Funding information All costings of the present work were	sessments but were even found of a tomatic descriptor system has proven		enlarged at a low extent with two p	Korea	r = .60; pigmentation: r = .5080). When ferent ethnicities, new signs were found	Conclusions Marked differences were observed in the skin ageing process between European and Chinese popula- tions, both in the prevalence of each facial ageing sign and their kinetics. Automatic grading performed on selfes and
ription of facial signs, independent from human vision, in ty applications, being individual, cosmetic oriented or dermato- forebaal, glabellar, uno	the system and those from demnatologists in live. The back camera des smartpho - of a better resolution than the frontal one - seems affording fournir de lég	only one lighting condition. Ont et RESULTS: addant	Funding information All costings of the present work were	characterize the facial photo-		Chinese subjects in the case of	entirely met by L'Oréal Research & Innovation Dot	variable conditions in the acquisition of		significantly increased severity of w	<sup>9</sup> L'Ovéal CDO – Digital Service Factory, Clichy, France	depending on ethnicity. Due to contrast	analysed by A.I is a fast and confidential method for quantifying sigm of facial ageing and identifying the main issues for such population and age-class, which is of practical interest, as it will allow the development of tailond prevention and
al with regard to the follow-up of medical and-ageing correc- global sagging (ptonis) c strategies.	slightly more significant correlations. However, although signifi- significativem cantly correlated, the signs of vascular disorders and check skin pores cutanes	The new automatic grading system of facial signs suits well to the second terms where the second sec	entirely met by L'Oréal Research & Innovation Dat	Results: (a) On the ten facial cantly (P < .0001) highly cor		based on automatic grading sy effects of the product on most		Conclusion: Such automatic descript		versus SP women (p < 0.05). A trend (p = 0.06) was observed after 50 yea	<sup>20</sup> Active Cosmetics International, Korean Medical Relations, Seoul, Korea	signs dealing with skin pigmentation wer	Therapeutic measures.
pores on the cheeks [7]. All these changes, that	pores present some dispurities that are likely linked to the technical ment à la div diversity of smartphones or self-shootings, leading to lower coeffi- yate, conduisa	women and provides data in close agreement with experts' assess-	indexed out	dermatologists (Wrinkles: r =		cessive applications.		in making-up procedures and may ex Haircare. As such it should allow large		Conclusion: This work illustrates so	<sup>33</sup> Active Cosmetics International, Global	Asian women than African or Caucasian found of a slightly higher accuracy than t	Received: 22 November 2021; revised: 28 January 2022; Accepted: 23 February 2022
ECTIF: De développer un système automatique qui quantifie la été de certains signes du visage à partie de photographies de type	cients of correlations. CONCLUSIO CONCLUSION: This automatic scoring system offers a promising offer use ag	-In both cases (expert's or automatic methodology), the accuracy condition of the accuracy state in ac		automatic scores showed sig		Conclusion: Such methodologi		ers' needs of esthetical improvements.		signs of South African women, who	Medical Relations and Communications, Levallois, France	Conclusion: The previously used autor	Conflict of interest
es' pris par des fermes d'origine ethnique et d'âge differents. In their well-known impu THOURS: 1140 fermen de trois achries differentes (Afro. unon the skin nizmental	approach in the harmonisation of Dermatological assessments of tons dermate skin facial signs and their changes with age or the follow up of a ligge et/ou	The applied case confirmed previous results obtained chrically, that is, that many facial signs were found of an increased severity à de 1		Texture, Pigmentation, and Pt increased severity of Wrinkle		consumers of a better transpar		KEYWORDS		In Europe or East Asia. Results signi	Correspondence	adding new facial signs apt at being deb	The study was funded by L'Onial and editorial assistance was funded by Vichy International 8. Onialt, FF, LJ, DA, DK, JTS, RJ, YZ, CK and CD are employees of L'Orial. TP has received grants and honorarium from L'Onial.
fcaines, Asistipes, Caucasiennes), d'ages differents (18-80 ont reis des selles auxa differente conditions d'éclainage et laufa). All these add	anti-aging treatments. cutané.	among men exposed to a severe urban pollution, as compared to pour 1 these bring in a less polluted city.		SP women (P < .05). A trend c		KEYWORDS		artificial intelligence, automatic descriptor,		coupled with photo-protective mean epidemiological studies that aim at	Frederic Flament, L'Oreal Research and Innovation, 9 Rue Pierre Dreyfus, 92110	integrating some limitations with regard self-pictured subjects. Presenting repro-	
ont pris del sense sola antereneza constront o calaruge et anno	Rosumé Introductic	-In both studies, statistical agreements between the automatic grad- ing watern and experts assessments were reached. In some facial		Conclusion: This work illustra		anti-aging efficacy, artificial intellig perception				contexts, the Al-based system offers	Clichy, France. Email: frederic.flamentight.loreal.com	medical grading, this system could chan	Introduction Clinical signs of skin ageing differ depending on et
otations utilisant les Atlas de Weillissement Outané. Ce tant noud for diferent ;	OBJECTIF: De confirmer la validité et la solidité d'un système de The human scorage automatique qui quantifie la sévérité de neuf signes du aging ercom	signs, the automatic grading system seems offering a slightly better homen		at home, some impacts of agin		heedbaar				detection and quantification of faci-	Funding information	epidemiological studies, where it offers a	Artificial Intelligence (A.I) and deep learning-based algorithms demonstrated by several genome-wide studies on diff are increasingly being used in medicine in the areas of diagnosis, genetic susceptibility to skin agoing between Cauca
pondence Predetc Planent, L'Oretéal Research and Innovation, 9 products) or an a pombl-	correspondence: Frederic Planerst, L'Orbal Research and Innovation, 9 alteration of	accuracy than the assessments made by the experts. Common Common Accuracy International Internation 9 externi		Results significantly confirm protective measures. In epide			1   INTRODUCTION	From birth		ments, and lifestyles.	All costings of the present work were entirely met by L'Oreal Research &	proach in the objective quantification of	patient morbidity or mortality risk assessment, disease outbrook. Asians, <sup>7-12</sup> However, there are only limited data, on a prediction and surveillance, and health policy and planning, <sup>1</sup> A.J. ple sizes, comparing the ikin ageing process in indivisi
Ferre Deyfas 92110, Clicby, Franze. Tel.: +33 149795334; fax: +33 a need does not only r 85142; e-mail: federic.flamen@rd.koreal.com owns a legal aspect by	Rue Pierre Dreyfus, 92110 Clichy, France, TeL: +33 149795334; fax: etc.) or pign +33 149795142; e-mail: Bederic.flamentainf.loreal.com mented and c	Rue Pierre Drepfas, 92110 Chdry, Prance, Tel.: +33 149795134; fax: Dams +13 149795142: empil: Indexi: famerailed local.com scores		here a share a share			"The most beautiful makeup of a	fies its appear. woman is passion'-Y nently confron		KEYWORDS artificial intelligence, automatic grading	Innevation Dpt.	KEYWORDS	has led to enormous advances in image classification and derma- European and Asian countries. <sup>(3,1)</sup>
			"Paralase is what I add to the photograph and what is	annathalan alamin than" S. Battan (Samtha)			Saint Laurent (French stylist, 19			and an		artificial intelligence, automatic grading syste	tology, especially for the automatic diagnosis of skin cancers. <sup>2-3</sup> Al and deep learning-based algorithms are increasin However, few studies have developed and tested Al and deep used in dermatology following the emergence of power
19 Society of Cosmetic Scientists and the Société Prançaise de Cosmétologie	472 © 2019 Society of Commet	© 2020 Society of Cosmelic Scientists and the Société Prançaise de Cosmétologi			© 2021 John Wiley & Sons A/S. Published by	John Wiley & Sons Ltd	© 2021 John Wiley & Sons A/S. Published by	y John Wiley & Sons Ltd.	This is an open access article under the terms of the original work is properly cited.	the Creative Commons Attribution License, which p	+ 2000 Lib With A Control (Control (Control)	International Advantage	karning to evaluate the progression of skin ageing processes." phones with high-resolution cameras. We have devel
			544 wilevonlinelibrary.com/Journal/srt		880 wileyonlinelibrary.com/journal/srt		Skin Res Technel. 2021-27:1081-1091.		© 2022 The Authors, Skin Resarch and Technolog	y published by John Wiley & Som Ltd.	© 2020 John Wiley & Sons A/S. Published by	John wiley & John Lite	EADV 2022 @ 2022 Gaussier Austeries of Dermitians and

## NEXT STEPS FOR AUTOMATIC GRADING TO A MORE HOLLISTIC AND ACCURATE AUTOMATIC GRADING SYSTEM

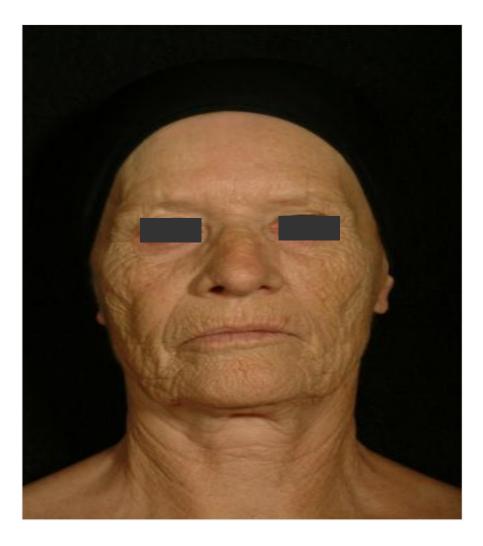
MORE FACIAL SIGNS FOR CONSUMER INCLUDING ACNE



# Perceived apparent age and impact of exposome

### **APPEARANCE**





Same age: 67 y.o.

## **AGEING, ANCESTRIES & CULTURE**



### **EXPOSOME, EXAMPLE SEASON**

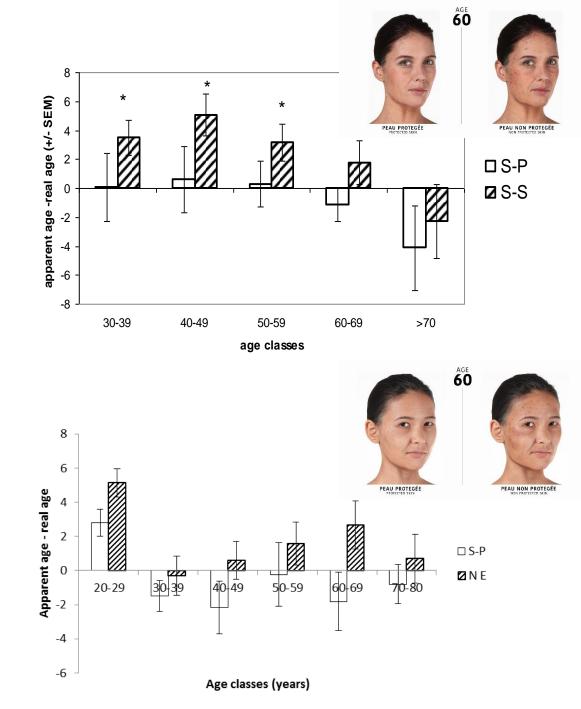
## Decode in each country/culture perceived apparent age with facial clinical signs

### **DECODE CONSUMER PERCEPTION**

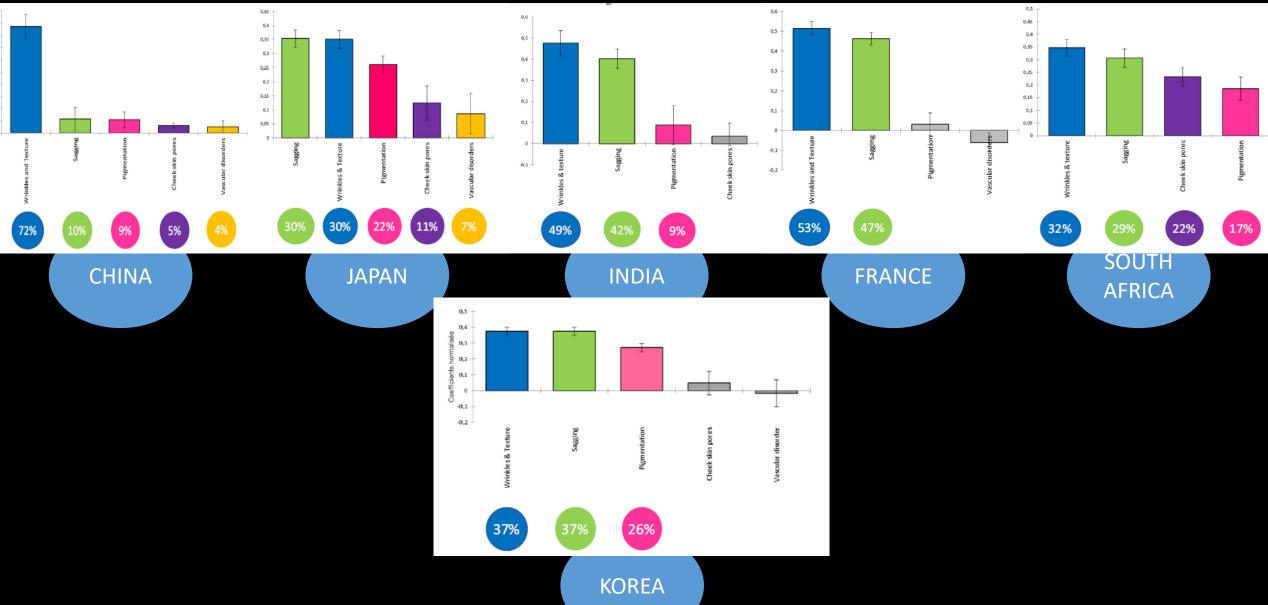
Appreciation by consumer of apparent ages

#### 7 countries

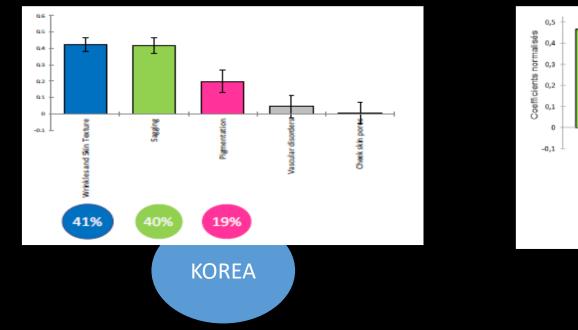
- Pictures of Men & women, aged 20-80 yo
- Annotations by 15 dermatologists
- 100 women by country, aged 20-60 yo
- Perceived age in years
- Other appreciations: Radiance, Tiredness

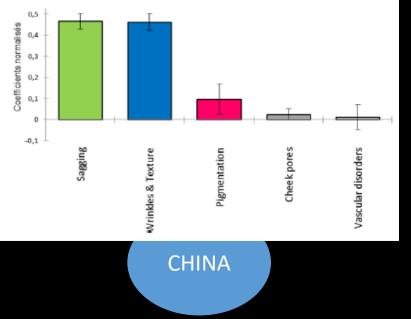


## HOLISTIC PERCEIVED APPARENT AGE (WOMEN)

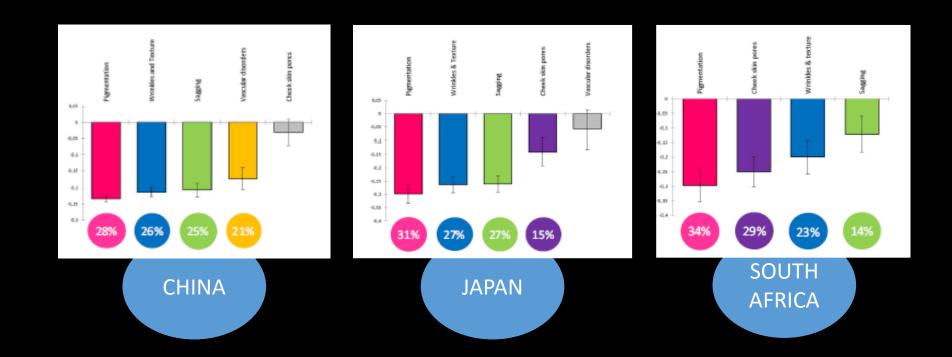


## HOLISTIC PERCEIVED APPARENT AGE PREDICT & DECODE CONSUMER PERCEPTION FOR MEN





## HOLISTIC PERCEIVED RADIANCE PREDICT & DECODE CONSUMER PERCEPTION



## TO A NEW PERSONNALIZATION

PROVIDE ACCURATE DIAGNOSTIC AND HOLISTIC ASSESSMENT TO CONSUMERS

ADDITION OF NEW FACIAL FEATURES ► 40 FACIAL SIGNS

