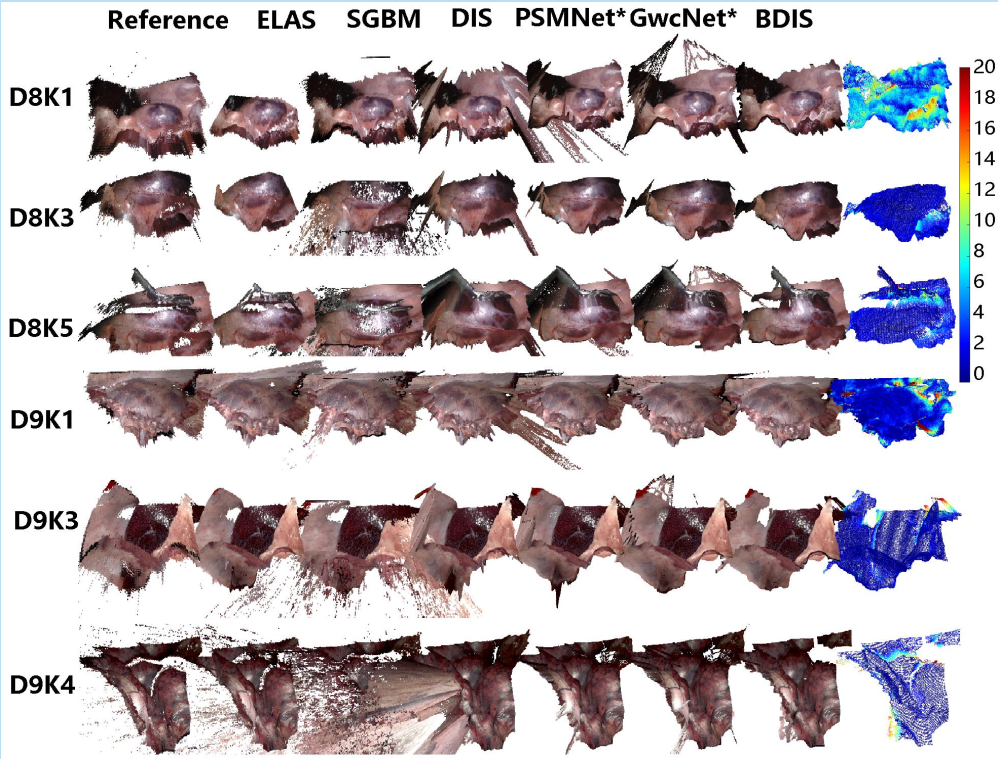
Monday

MICCAI 2022 Singapore

DAILY

September 18-22



Brilliant Oral and Poster Presentations

Workshop:
STACOM

Welcome by the President of MICCAI:
Caroline Essert

Editorial with General Chair:
Shuo Li

Women in Science:
Esther Puyol

Today's Picks by:
Andrea Lara

In cooperation with
Computer Vision News
The Magazine of The Algorithm community

A publication by
RSIP VISION

For today, Monday 19

Andrea Lara is the director of BiomedLab at Galileo University in Guatemala. She is currently a PhD candidate at the Institute for Healthcare Engineering with the European Center for Medical Device Testing at TU Graz, Austria.

"My research focuses on medical image analysis and deep learning applied to cardiac imaging. My current work is the development of a deep learning based method for the quantification and assessment of myocardial perfusion using dynamic contrast-enhanced cardiac CT.

I am also the director of BiomedLab a biomedical engineering research laboratory in Guatemala where we focus on the development of low-cost technologies and ML-based health care solution."

"This year, I am happy to be part of the MICCAI tutorial chairs and the organizing committees of RISE-MICCAI and WIM-WILL. I am looking forward to the presentations and the networking events where I hope to meet as many of you!"

Andrea's picks of the day (Monday):

ORALS:

(Oral 1) Detecting Aortic Valve Pathology from the 3-Chamber Cine Cardiac MRI View
(Oral 2) Accurate and Explainable Image-based Prediction Using a Lightweight …
(Oral 3) Video-based Surgical Skills Assessment using Long Term Tool Tracking
(Oral 3) Towards Holistic Surgical Scene Understanding

POSTERS:

(Poster 1) Hybrid Spatio-Temporal Transformer Network for Predicting Ischemic …
(Poster 2) Ensembled Prediction of Rheumatic Heart Disease from Ungated Doppler …

Good morning MICCAI!

Welcome to the first edition of **MICCAI Daily 2022**. **MICCAI** and RSIP Vision (the publisher of **Computer Vision News**) have partnered for the seventh consecutive year to bring our magazine to the community. Follow us today, tomorrow, and Wednesday to keep up to date with all the highlights from this leading event.

For those of you with us in person, **welcome to Singapore! Thank you so much for coming!** We're delighted to be hosting the conference in Southeast Asia for the first time. We hope you take this opportunity to explore a different culture and join us in celebrating MICCAI becoming **more global and inclusive than ever before**.

This event is our first **in-person meeting** for three years, and to say that we've missed you all would be an understatement. We hope MICCAI 2022 will be a chance to reconnect and rebuild our society after such a long time apart. MICCAI started in 1998, but in the future, we'll look back at 2022 as a new beginning from which we saw much growth and change.

While we're very excited to see everyone here, we're also pleased to engage people who couldn't make it. This year is the first time **we're officially hybrid**. People tend to associate hybrid events with the pandemic, but we've been discussing offering a hybrid solution for several years, and there is no time like the present to start.

We saw some **excellent satellite events** yesterday, with many more to come later this week. We received many high-quality proposals this year and have accommodated as many as possible. With such a diverse community, whether you're application-focused, more interested in methodology, or prefer a combination of the two, there is something for everyone.

We would like to personally offer the warmest of welcomes to any first-time MICCAI attendees. Make the most of this chance to learn and engage with others. If you're watching remotely, we're sorry you can't be here but are very glad you've been able to join in. **You all belong to this community!**

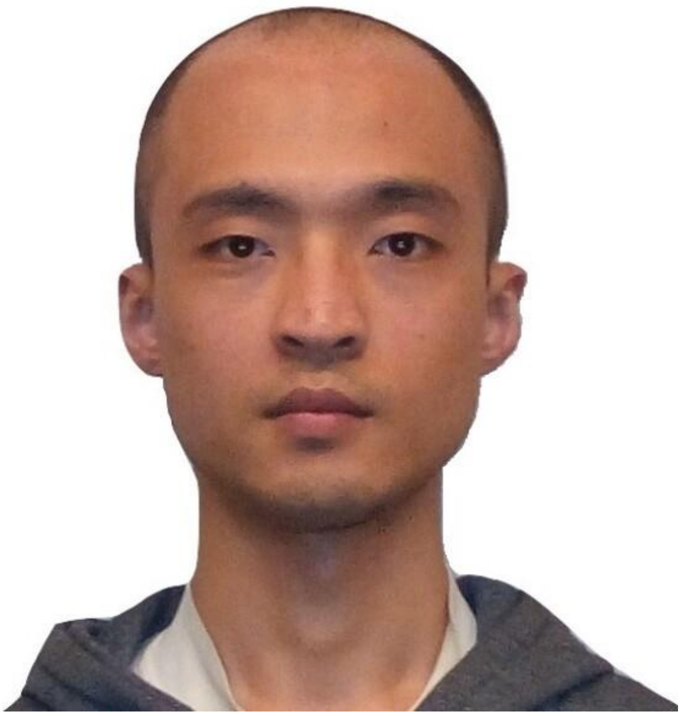
We wish you **a successful MICCAI!** Enjoy reading this first issue of MICCAI Daily and come back tomorrow and Wednesday morning for more. Don't forget to share our link with your friends and colleagues!

Shuo Li
General Chair, **MICCAI 2022**
Associate Professor, **Case Western Reserve University**

Ralph Anzarouth
Editor, **Computer Vision News**
Marketing Manager, **RSIP Vision**

Bayesian Dense Inverse Searching Algorithm for Real-Time Stereo Matching in Minimally Invasive Surgery

Jingwei Song completed his PhD at the University of Technology Sydney before pursuing a postdoc at the University of Michigan's Robotics Institute. He just enrolled in United Imaging in China as a Senior Software Engineer and continues to pursue research in its Research Institute. He speaks to us ahead of his oral presentation this afternoon, which explores CPU-level real-time stereo matching for surgical images.

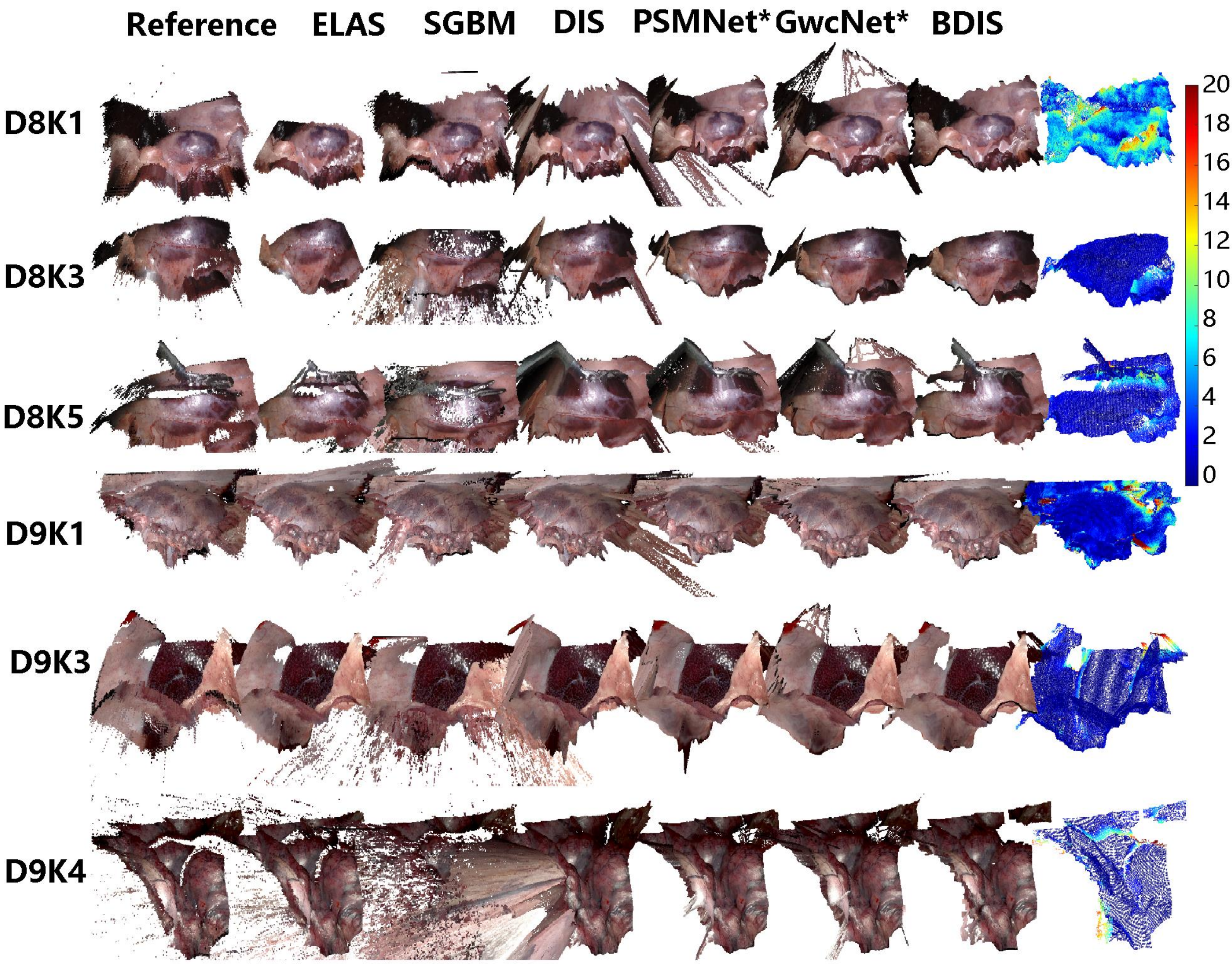


In this paper, Jingwei proposes **a CPU-level real-time stereo matching method for stereoscopes**, such as stereo endoscopes or stereo laparoscopes. Engineers can deploy the algorithm on their CPU hardware and achieve real-time 3D reconstruction. The benefits compared to using an algorithm based on a GPU are that you can save the computation of GPUs for other tasks like diagnosis, segmentation, localization, or registration. However, there are some problems to overcome first.

"*The surgical scenario suffers from* ***bad illumination, textureless surface, and dark regions****,*" he points out.

"*To solve this, I devised* ***an innovative Bayesian algorithm to measure the uncertainty of the matching results****. If the results are bad, I delete them or use some of them to do fusion and have a better, more robust reconstructed shape.*"

When performing the stereo matching, the basic idea is to find the illumination consistency, so the pixel on the left image should have the same illumination as its correspondence on the right image. However, due to bad illumination, the illumination consistency can be dense. Also, if there are textureless surfaces, the left pixel can be registered to any pixel on the right side because all pixels share the same illumination.

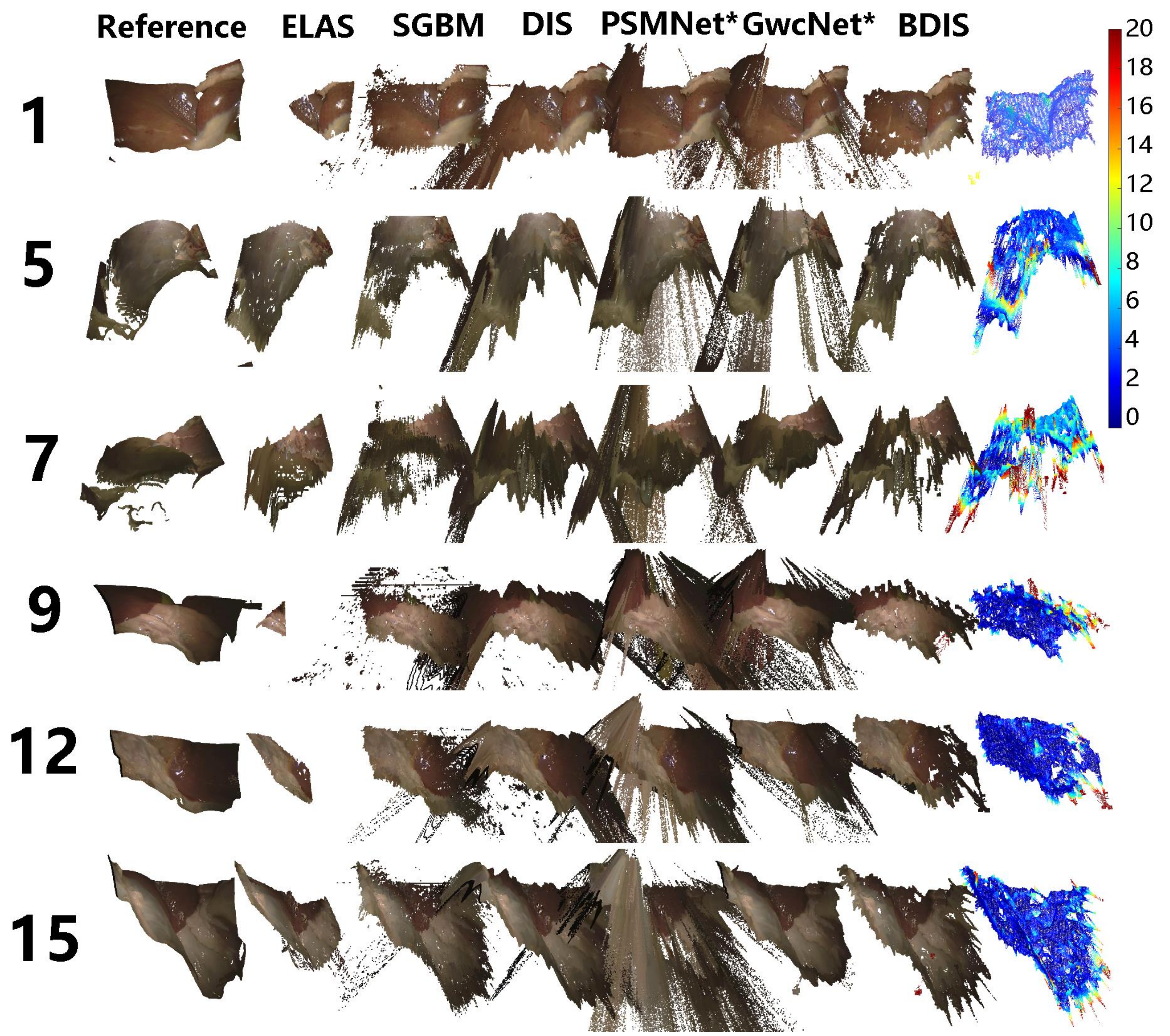


The two figures show sample reconstructions of the SCARED and SERV-CT stereo data set. The first column (reference) is the ground truth. ELAS, SGBM and DIS are results from the prior-free methods. PSMNet and GwcNet are prior-based algorithm requiring prior labeled data. BDIS is the proposed method. The error map (in mm) of the last column is the error of BDIS.

"*If the left patch, the left pixel, can be matched on the right pixel and we design the inverse of the residual of the illumination as the response, then we can have this figure,*" Jingwei explains.

"*If I move the patch slightly to the left, the response will decrease very quickly left and right because they're perfectly matched, well textured, and well illuminated. For this response curve, when I move left and right, it will have a peak, and then it will decrease very quickly. But for a textureless surface on the right, if I move left and right, the curve is quite smooth. It doesn't have a very high peak there. Think about a white wall. This curve will be a straight line when we move left and right.*"

The same also applies to non-Lambertian reflectance. For all three problems, the curve looks like this very flat curve. **To convert this problem into maths, Jingwei uses Bayesian modeling**. He gives the matched one some disturbances and estimates this kind of curve, using this as a probability. The probability is high for well-illuminated, well-conditioned figures, and for the other three problems, the probability is low.

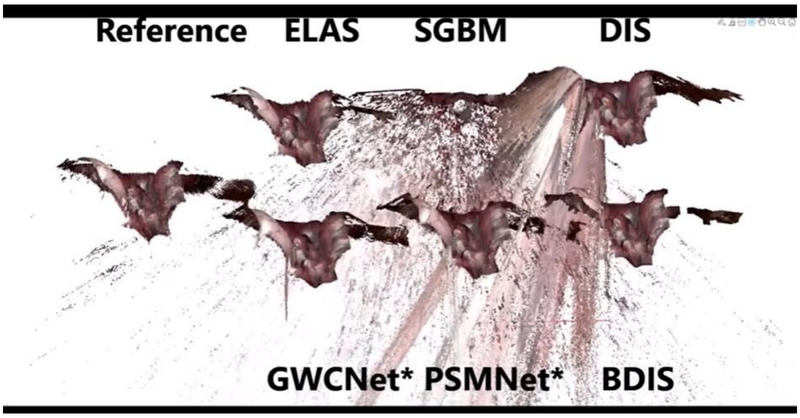


"Here is the entire diagram of this process – it's a coarse-to-fine process, and the left to right image patch matching is on all levels," he explains.

"Each level can be used as an initial value for the next finer level. You may know the optical flow algorithm named Lucas-Kanade, and this is a faster version called Fast Lucas-Kanade. I didn't create it, but the idea is simple. The patch on the left should be matched on the right, and we

should calculate the Jacobian and iteratively estimate the optimum corresponding patch on the right. Using the inverse of the left instead of the right to estimate the process is much faster because the Jacobian can be estimated only once. I estimate and quantify the probability for all the matching."

Jingwei has added other ingredients to this technique to make it more robust. **He uses an algorithm to convert the probability to variance so that after this process, he has the 3D shape and the variance to quantify the point**.



This work has been extended to a journal, but Jingwei is already working on some other challenging research on surgical robots, which he hopes could lead to a paper for MICCAI next year.

"It is a great honor to have a paper accepted by MICCAI, and it's even greater to be an oral presenter," he tells us.

"I spent almost a year on this research because I traversed many algorithms and techniques and finally found this algorithm works!"

Does he have any tips for someone looking to secure an oral at MICCAI next year?

"I'd suggest you keep polishing your paper," he advises.

"MICCAI only accepts eight pages with one column, so it's limited space. Polish your writing carefully to include the most important details. Also, my work is open source. I make the code publicly available. I think MICCAI like that because many people don't open source their code."

If readers want more technical details of this work's equations, formulations, and deductions, you can find Jingwei's full paper on **arXiv**.

To learn more about Jingwei's work, you are invited to visit Oral 3: Surgical Data Science today from 15:30-17:00 and Poster 3: Computer-Assisted Interventions (Virtual) from 17:00-18:00.

Good morning MICCAI!

I'm so happy to welcome you all in person again after two tough years. We've had our virtual conferences, but it's so exciting to be back together, and I'm sure this will be a very memorable edition. I hope everyone will take full advantage of the chance to gather and discuss the science and technology on show. Talking in person in front of a poster is the best way to interact with authors. **It's the real thing!**

Also, do take the opportunity to network at the different social events this week, including the gala dinner and the welcome reception. We've tried in recent years to replicate the networking events virtually, but **nothing beats seeing each other face to face**.

I also warmly welcome those who cannot travel to Singapore for various reasons. Organizers have done their best to arrange virtual poster sessions, with the possibility to interact remotely. We hope this test will work, but we also hope that the remaining Covid travel restrictions will be lifted so we can gather more broadly in person in the future.

Having said that, **I've been pleasantly surprised to see so many people here this year!** Pre-Covid, everybody wondered why we wanted to keep in-person conferences due to the new technologies enabling better remote interaction. However, now that we've been forced to experiment with virtual attendance, we know it's not the same, and we all feel the need to meet up again.

Of course, we must find a way to make these conferences more sustainable relative to the environmental considerations. We're very aware of the problem of needing to offset our carbon footprint. Conferences mean flights, cars, and other environmental issues, but we also realize that entirely virtual meetings are not ideal for networking.

It’s a balancing act, and we’re considering various options, including local events between the big annual one. Let’s see what the future holds.

Speaking of the future, the call for papers will be out very soon for **MICCAI 2023**, which will be held **in person in Vancouver**. Don’t miss it! We’re so enthusiastic about being back together this year, and next year we hope to see even more of you who couldn’t make it this time.

Welcome to Singapore, everybody, and I sincerely hope you enjoy the conference!

Caroline Essert
Professor, **University of Strasbourg**
President, **MICCAI Society**

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Statistical Atlases and Computational Modeling of the Heart

by Marica Muffoletto.

Marica is currently working at her CDT in Smart Medical Imaging at King's College London.

She is also Engineering Editor at Computer Vision News magazine since 2020.

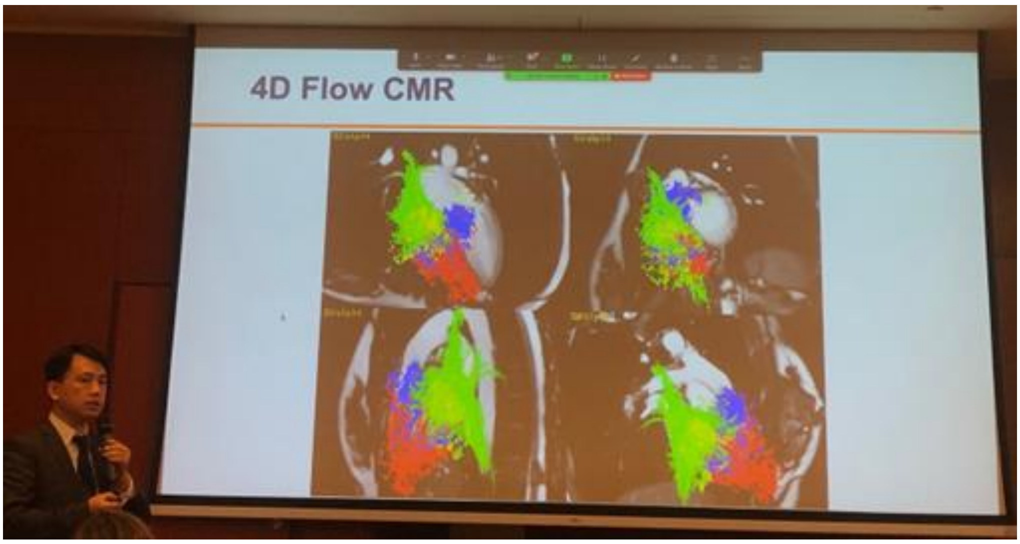
Find her on Twitter @maricas8.

MICCAI has finally started here in Singapore. The first day hosts a bunch of workshops, and I was visiting STACOM - **Statistical Atlases and Computational Modeling of the Heart**, which has been around for 13 years now, and is organized by a great team of researchers- Alistair Young (King's College London), Maxime Sermesant (Inria, France), Oscar Camara (Universitat Pompeu Fabra, Spain), Esther Puyol Antón (KCL), and Avan Suinesiaputra (KCL).

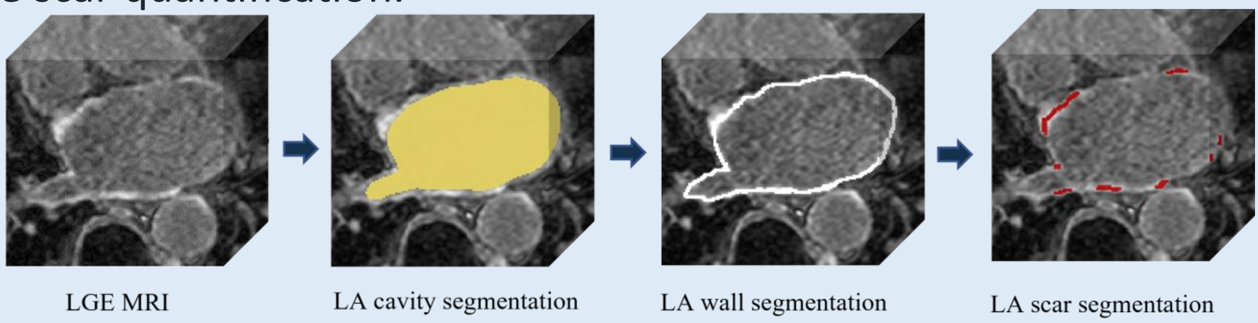
We started with a talk from **Victoriya Kashtanova** on cardiac electrophysiological modelling who combined single EP Mitchell-Schaeffer models with a DL-based approach (ResNet) to achieve personalization of the action potential. **Carlos Albors Lucas** followed with his work on computational models to analyze haemodynamics from dynamic CTs. He presented his method DM-DCT, highlighting the importance of LA wall motion for thrombus estimation. **Lei Li** showed how to combine CMR, ECG and patient metadata (age, sex, BMI) using a VAE and a point cloud input to predict conduction velocity and root nodes, to identify myocardial infarction. After **Xiaoran Zhang** who talked about his project on Biomechanics informed Modeling for cardiac image registration, we ended the first session with (*"finally!"* cit. from organizer) the first talk of the day on statistical shape modelling led by **Jadie Adams** (in the photo next page).

Jadie's work, called **Spatio-temporal Cardiac Stratistical Shape Modeling: A data driven approach** is the perfect ending to a very interesting section and she indeed won a well-deserved prize for it! In her research, she focuses on spatio-temporal data and how to generate point distribution models (PDM) by an optimization scheme across shape & configuration spaces using a software called **ShapeWorks**. Simultaneously optimizing across subjects and time points, she achieves astounding results. After she showed us that generative modelling can generalize her proposed approach by capturing the temporal projection of space, we really hope to see follow up work on incorporating latent diffusion modelling (LDM) to her pipeline.

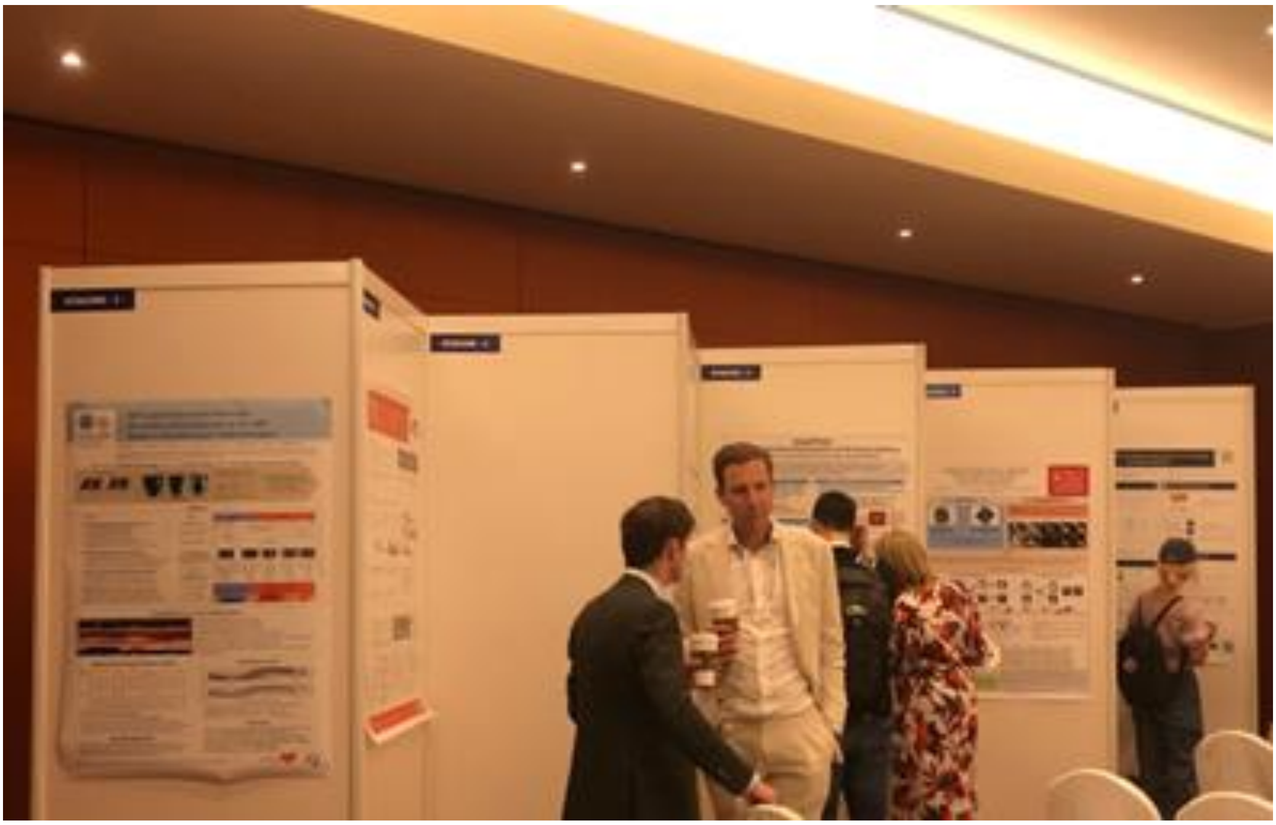
Next, the local researcher and Keynote speaker **Liang Zhong** (below) introduced his project **INITIATE**. His talk focused on the importance of diagnosing and treating **Congenital Heart Diseases** (CHD), a lifelong chronic condition, and on the significance and challenges of a correct analysis of the Right Ventricular function. INITIATE is born with the intent of filling the lack of an Asian centric database for CHD and aims to build 4 main toolkits – 1) segmentation and modelling, 2) Feature Tracking, 3) 4D Flow and 4) Quantitative markers.



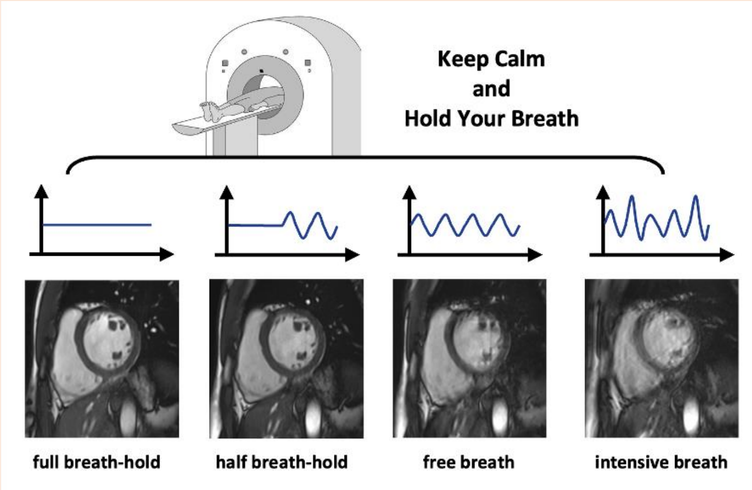
The **LAScarQS 2022 Challenge** organised by Xiahai Zhuang from the Fudan University (China) focuses on the LA wall segmentation and the scar quantification.



Yuchen Zhang, winner of the first position, showed his boundary-focused nnUNet, where he combined 2 nnUNets, a TopK + Dice Loss and a signed distance map of the boundaries to explicitly model spatial relationship. He was followed by the author of **UGformer**, a 2-stage segmentation model made of an enhanced transformer block and a GCN-based structure to optimize the global space of intermediate feature layers. **Sihain Wang** showed his multi-depth segmentation network to address variation in scar size and shapes with an additional plug-and-play Sobel fusion model, which extracts LA boundary information to improve scar segmentation. The other discussed techniques included a Multi-scale Weight Share Network (**MSWS-Net)**, which employs a UNET modified to extract features at multiple scales and **LASSNet,** a 4 steps DNN model.



The second challenge (**CMRxMotion**) was organized by yet another participant from Fudan University, Shuo Wang and hosted by Chen Chen and Ouyang Cheng from Imperial College. It addressed respiratory motion artefacts with two main tasks: 1) CMR image quality assessment and 2) robust CMR segmentation.

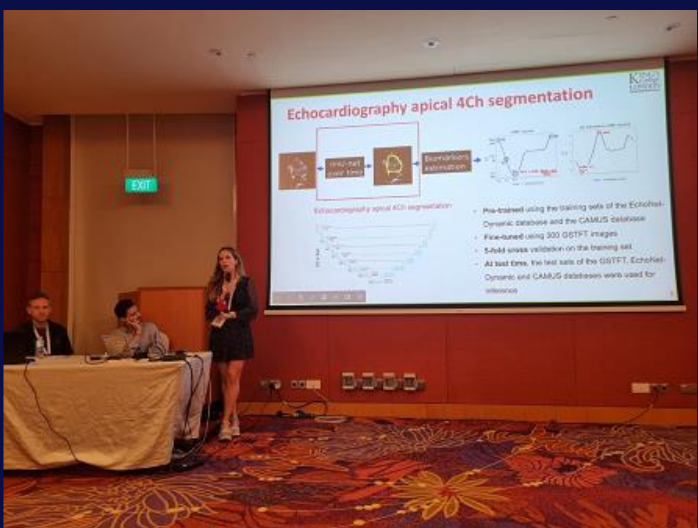


This session included talks on a wide range of techniques- from recurrent neural networks and "insane" data augmentation to deformable convolutions, multi-task learning and ensemble classification frameworks.

Yasmina Al Khalil started introducing the method OPENGTN, which won 3rd Place on both tasks, and included two sections, an auto-encoder trained to reconstruct images with noise for prediction of quality control, and then an ensemble of models to improve robustness through data augmentation helped by region-based training which segmented apical, middle, and basal slices separately. The 2nd place on Task 1 was won by the Philips CTS method from **Xiuzheng Yue**, combining deep learning for global view and machine learning for LV radiomics feature extraction through voting, while the 1st place was achieved by UON_IMA, from **Ruizhe LI**, where the author used a biased voting strategy to aggregate the decisions from different patch-based models.

The last session covered some echo-based projects such as **Unsupervised Echocardiography Registration through Patch-based MLPs and Transformers,** a patch-based MLP/Transformer method to extract features from echo data, and another one by **Matthias Ivantsits** (image next page) who built an end-to-end oriented mitral valve DL surface reconstruction, applied to 3D TEE data and employing a Voxel-Encoder, Voxel-Decoder and a Mesh-Decoder.

The paper **Efficient MRI Reconstruction with Reinforcement Learning for Automatic Acquisition Stopping** showed a policy network with a state signal value and a penalty term to estimate the reconstruction, and we finished with **Marcel-Beeze,** presenting a project on reconstructed 3D cardiac anatomy meshes for 3D shape-based and contrast-based major adverse cardiac event (MACE) risk prediction; and **Buntheng LY**, who applied LIME and Integrated gradients methods to meshes obtained by Graph Convolutional Network (GCNs).



Don't miss our Woman in Science of today on page 22!

The MICCAI community asked for a magazine fully dedicated to medical imaging and MedTech...

... RSIP Vision did it !!!

Medical Imaging News

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Greedy Optimization of Electrode Arrangement for Epiretinal Prostheses

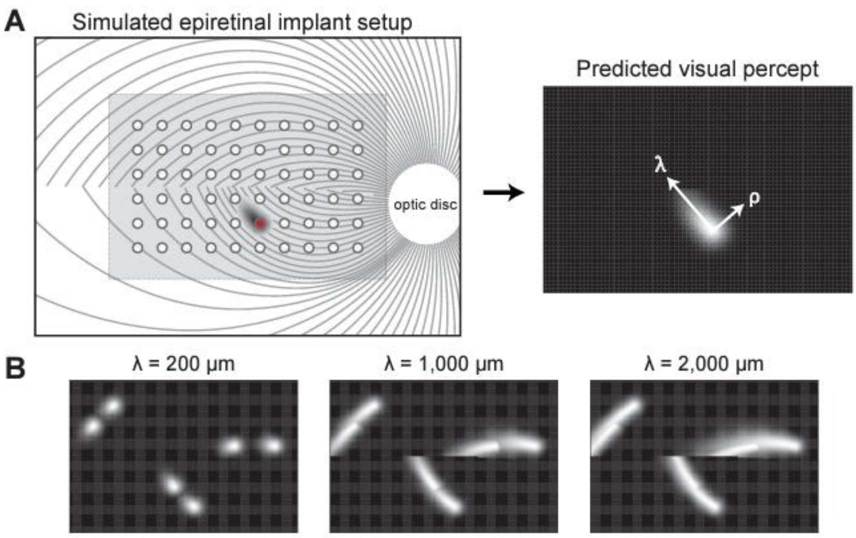
Ashley Bruce is a recent graduate from UCSB and a Software Engineer at Veeva.

Michael Beyeler is an Assistant Professor in Computer Science and Psychological & Brain Sciences at the University of California, Santa Barbara.

Ashley and Michael speak to us ahead of their poster presentation this afternoon about their work exploring the optimal arrangement of electrodes in epiretinal prostheses.

Several diseases could result in blindness, including some that slowly attack the retina. For the most part, these are hereditary diseases with no cure. **Retinal degeneration** leads to sight loss because retinal cells are the first step in the vision process. However, even when that first step is gone, it is still possible to hijack the pathway if everything else works.

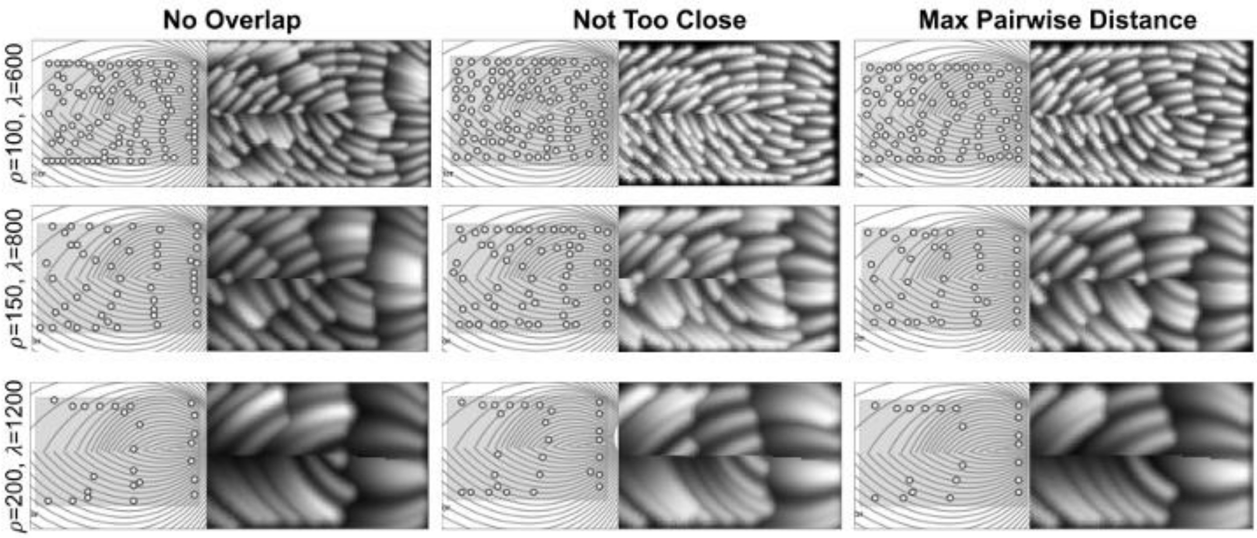
"***Epiretinal prostheses bypass the dead retinal cells by stimulating the next part of the pathway,***" Ashley explains. "*They stimulate the surviving cells and can produce these phosphenes or flashes of light and, quote-unquote, restore vision.*"



There are already prostheses that use this pathway, but little research has gone into **optimizing the placement of electrodes on the prosthesis**. That is where this work comes in, proposing a better way to arrange electrodes on the implant to produce greater phosphene coverage.

"Current devices arrange their electrodes on a rectangular grid because it's compact and easy to fabricate," Michael tells us. *"Some people have looked at where to place the whole implant on the retina. Ashley was the first to ask, what if we moved every individual electrode around based on what we know about how these electrodes produce artificial vision?"*

However, moving every electrode presents the problem of combinatorial explosion. Even in current devices with only 60 electrodes, there are many possibilities for arranging them. It is not usually technically feasible to find a solution.



*"Ashley approached this as **a greedy optimization problem**, where one electrode is placed after another,"* Michael explains. *"We used a computational model of bionic vision to help predict what the vision would look like for a given electrode placement. By iterating over that, Ashley found a mathematically proven optimal solution."*

Greedy optimization is just that – a greedy approach to optimization. Each electrode is taken one at a time, its best placement is found, and it stays there. Then the same is done with the second electrode, taking a greedy approach to placing the electrodes in their optimal positions on the implant.

"We don't place the electrode if it doesn't improve the final result," Ashley adds. *"When you start getting higher ρ and λ values, or when you get too high in the number of electrodes, each electrode might not add as much to the next iteration. Therefore, we considered a small upper value to ensure we were still increasing our results; otherwise, that electrode was not helpful."*

Before settling on the greedy approach, Ashley and Michael went through several other options. They started exploring biological methods, including **particle swarm optimization**, which looked promising.

"We spent a lot of time on that, but there was no guarantee that the minimum we found was optimal, and it took way too long for something that wasn't even a fully optimal solution," Ashley recalls. *"When that didn't give us the results we wanted, it was rough, but it helped us re-evaluate and find a better solution."*

Outside of this project, Michael's lab works on how retinal and cortical implants produce artificial vision, using **insights from neuroscience and methods from computer vision and AI**. Meanwhile, Ashley just accepted a job at **Veeva**, working on software engineering for the life sciences.

"It's really cool because I did my undergrad in biology and graduated in computer science," she says. *"When choosing a lab to work in, I was drawn to Michael's because it was a mix of that bio and computer science world. I'm happy to continue my passion for merging the life sciences with computer science and hopefully building a better future."*

Where does she see herself in five or ten years?

"It's hard to say because I used to think so far ahead, but now I like to figure out what I enjoy and continue doing that. If I'm no longer enjoying it, I'll make some changes, but currently, I like what I'm doing."

This conference paper is Ashley's first and has been a labor of love at times.

"Running these simulations took a while – I always had ten instances of Google Colab up at once to run every simulation with a bunch of different parameters," she tells us. *"I'd be sitting at my computer just going through all the tabs making sure that none of my Colabs had timed out. It could take more than eight hours to run them, and if I let them time out, I'd have to start over. If I ran them while I was asleep, I'd sometimes wake up in the middle of the night and have to get out of bed to check! It's funny looking back on it because I would wake up every morning and think, time to run my ten tabs of Colab before I start my day!"*


Michael Beyeler

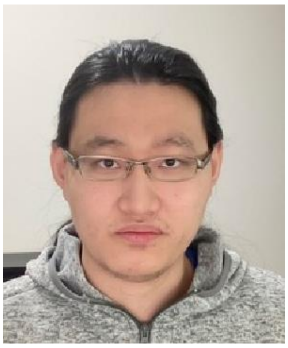
Ashley and Michael have been looking at the optimal arrangement of electrodes in epiretinal prostheses, but **their work could be generalized to other prostheses**. The field is relatively new, so there are many opportunities to explore.

There is lots of potential for this type of research to be used in the community to help patients, but it is still early days. Simulations do not always correlate precisely with real life, and patients have many different ρ and λ values that impact how the implant affects them, so more testing in the real world is needed first.

"We've shown there is merit in using computational models to design new implants and that the current electrode layout might not be the best." Michael points out. *"In that way, we're using insights from neuroscience to design better technology. We hope our work can help guide future prototyping of new devices."*

To learn more about Ashley and Michael's work, you are invited to visit Poster 3: Computer-Assisted Interventions (In Person) today from 17:00-18:00.

NVUM: Non-Volatile Unbiased Memory for Robust Medical Image Classification



Fengbei Liu is a PhD student at the University of Adelaide in Australia, under the supervision of Prof. Gustavo Carneiro.

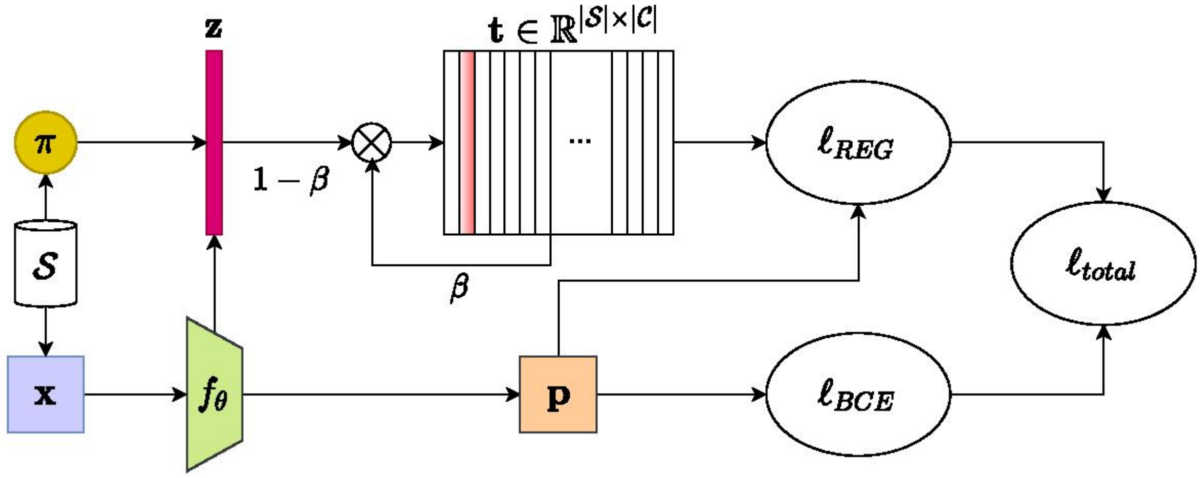
His work explores learning with noisy multi-label imbalanced data. He speaks to us ahead of his poster presentation this morning.

In traditional supervised learning, we want a model to learn from an image to fit a label and assume the label is correct. Training usually takes place under an ideal scenario using a balanced distribution of images per class.

In **deep learning for medical image analysis**, when large-scale manually-annotated datasets are unavailable, **natural language processing tools** are sometimes used to annotate datasets with labels extracted from radiologists' reports. Using this automated process without verification can lead to unreliable or noisy labels. Also, images often require multiple labels and have class imbalances due to the variable prevalence of diseases.

"In medical imaging, typically, most patients are fine, but some have a disease. If you train your model directly on this imbalanced data set, you'll have a model that always predicts patients to be okay and fails to predict patients having diseases," Fengbei explains.

"We use a deep learning method ***to train a DenseNet model*** *on the given images and propose* ***a new regularization method*** *that, unlike other methods that try to select noisy samples, regularizes the training*



over time so that we don't need to select them. ***This new regularization method overcomes the label noise and the imbalanced learning problem****. We can deal with both issues together."*

The work introduces two new evaluation benchmarks, training on noisy multi-label imbalanced chest X-ray training sets formed by **Chest-Xray14** and **CheXpert**, and testing on clean multi-label datasets **OpenI** and **PadChest**. Compared with other methods, **NVUM** achieved state-of-the-art results.

Previous works have studied the noisy labels and the imbalanced learning problem but have not tackled the two jointly. Fengbei says this is the first paper to propose training on both.

Gustavo Carneiro's team has six papers accepted at MICCAI this year – what does Fengbei think makes him particularly proud of this work?

"***We've been working on this paper for two years, since my PhD started****, and it's not the first time we've submitted it to MICCAI,"* he reveals.

"We submitted a primary version last year but got rejected. However, we improved the paper quality and successfully made it this year."

What was the trick?

"The main problem last year was that we didn't consider the paper's motivation. We only tried to solve the problem but didn't state well enough why it's so important for medical imaging that this problem is addressed. ***This year, we clearly highlighted the motivation in the paper's first section****."*

Fengbei says the team is already working on extensions and hopes doctors will warmly receive their contribution.

"We haven't had any doctors see our work yet, but we're hopeful they'll be satisfied by our outcome," he tells us.

"***Chest X-ray classification is an important task for doctors, who must train for a long time to be successful****. If our model can help simplify the whole process, we're happy to play a part in this."*

To learn more about Fengbei's work, you are invited to visit Poster 1: Computer Aided Diagnosis I (In Person) today from 10:30-11:30.

Esther Puyol is a Research Scientist at HeartFlow.

More than 100 inspiring interviews with successful Women in Science in our archive

Esther, what path brought you to HeartFlow?

I just started three months ago. Before that, I did my PhD and postdoc at King's College London, where I was developing new AI techniques for analysis of cardiac imaging – both ultrasound as well as MRI data.

How did you get into this field?

This was during my undergraduate in France, where I was learning about deep learning and AI – well, at that time, it was machine learning. Then I did an internship at Philips in France, and we started with some machine learning. I really liked it, it was in the area of cardiac, and then during my PhD, that was the main focus, developing new techniques for combining MRI and ultrasound for quantification of cardiac motion.

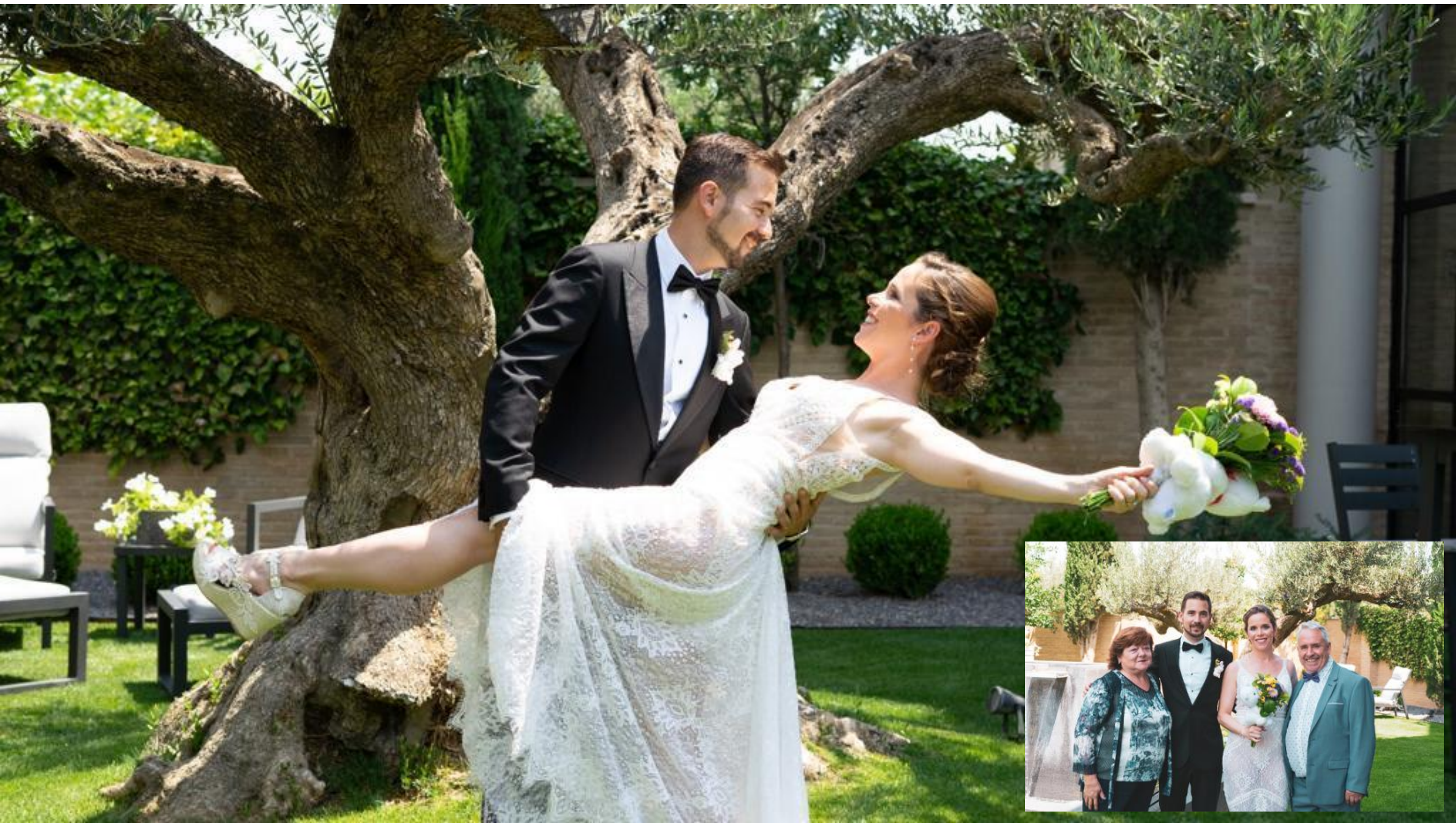
Did you want to be a doctor when you were a kid?

A little bit, yeah! [*she laughs*] I liked it, but then I also knew it was quite challenging and demanding, and I also liked the engineering side, so I think biomedical engineering is a good mix.

It's a good mix, and you're working to save people's lives.

[*Esther smiles*] Yeah, let's say it this way!

What attracts you to this field?



I was very lucky during my postdoc and PhD because I worked directly with doctors. We were trying to make something that would work in clinic, that people could use, and that may in the future help patients. That's what attracts me, especially thinking maybe one day I can make a contribution to clinics.

You're just starting out, but do you think that during your career, you'll be able to help people in clinical settings or create technology that will help people feel better?

I guess it's difficult to say, but I hope that one day I will develop some technology that could help – maybe not directly to save someone, but help the doctors make better predictions or better decisions that will benefit patients in the future.

Let's dream: What would 100% success be for you in your career?

[*Esther thinks*]

Nobel Prize in Medicine?

[*she laughs*] Exactly, that would be a really good dream! I think I'm a little bit less ambitious. I would be very happy to see a tool used in hospitals in different countries – not only in the UK where I'm based but also internationally.

You're not really English, are you?

No.

Where are you from?

Spain.

Where in Spain?

Barcelona.

Barcelona? You're Catalan?

Yes. [*she smiles*]

Okay, we've featured a few Catalans. We had Laura Leal-Taixé.

I've heard of her.

Why are you in the UK?

I did my first degree in Spain and then my second degree in France. When I was at Philips, they were collaborating with King's College as a PhD and told me, if you want, you can go there. That's how I ended up in the UK.

How nice, and you like it?

Yes, a lot.

Tell us one special thing about Spain, one about France, and one about the UK.

Well, I'm from Barcelona, so the beach, definitely! [*she laughs*] From France, I like the culture and the ambiance. I think it's really good. London, I don't know, I fell in love with London when I moved, so everything! [*laughs*]

Have you had a winter in London?

Oh, yeah, I have.

And you still like it?

[*Esther laughs*] Yes!

That's very nice. You are a special Catalan!

Yes, I know!

How is the university?

It's really good. I like everything about it. It's a really good community, and we work very closely together. Also, I like the way the department is structured because we're based in a hospital, so we have access to clinical data.

That reminds me of something Nassir Navab told me a few years ago. He wants his team to be in regular contact with doctors so that the solutions they develop are very well anchored to the real world.

Exactly. That's exactly what I would like too, this very close relationship between doctors and engineers. You do something that they want, and they do something for you.

What is the thing that surprised you the most from your contact with real doctors?

Sometimes it's hard communicating. It's not the language itself, it's that we see things from different angles.

You're very certain of things, they're very certain, and you need to convey or make a language that both of you understand and learn from them the same way they need to learn from you.

Do you ever have the temptation to explain things to doctors?

Yeah, I try many times, and sometimes I succeed, and sometimes I fail! [*she laughs*]

Can they convince you?

In some areas, yes, because they're the experts. When they talk about pathophysiology, I need to trust them because it's not my area of expertise. The same way that when I talk about AI, they are more like, okay, if you say it.

If you had been a doctor, what area would you have chosen?

Cardiology, I guess.

What's in the heart that is special for you?

I like it because it's one of the organs that keeps moving throughout your life. It beats and contracts and expands. It's interesting how it's kind of the motor of all your body.

That's a nice definition. I'm sure that most cardiologists would agree with that. It's also very easy to find emojis of hearts.

The heart looks beautiful, right, in all the emojis? Also, it's about love.

What do you miss the most about Spain?

I think it's family and close friends. It's different being away. I was only with my partner at the beginning, so it was more challenging than back home having a good background.

Are you Catalan or Spanish?

[*Esther laughs*] Both, let's say!

Okay, I will not ask anymore! [*we both laugh*] So, you miss family and friends – and food, certainly?

Well, we still cook a lot of Spanish food, but I miss fresh fruit and vegetables that taste nicer there.

Yours are the best tortillas in London?

Exactly, yes. I try!

What will be your next steps?

I just started in HeartFlow, it's only been three months, so it will be nice to stay with them for a while. It's a new challenge, especially moving from academia to the industry.

What is one thing you need to learn from HeartFlow that you don't know yet?

This is a medical company and I've been mainly working in academia. It's very different. I would like to understand what the steps are to get from an idea to a product. How do you then sell it? Maybe one day I'll want to do it for myself, create something like a company, and I think it's important to understand every single step. How do you go from A to B, and what are the challenges and opportunities?

Do you think one day you'll be brave enough to launch an idea of your own?

That would be a good day. A good dream, yeah.

Are you not afraid?

Yeah, but you need to be brave in life, right? [*she laughs*]

Of course, tough ladies need to be brave.

Exactly.

Can you also envisage that something could go wrong, and you'd have to start over again?

Yes, exactly. But I guess if you have a strong background and experience, you can always go back to either industry or academia. You've got to try it at least.

It sounds like you feel lucky that you had what you had.

Yes, very lucky. From being given the opportunity to go to France to do the second degree and then, at that time, them contributing towards King's College for a PhD. I work very hard, but I also feel like I've been very lucky in the sense of the opportunities I've been given and the people who've supported me. I have good background support from my supervisors and everyone at King's that allows me to grow and become a better researcher.

Who are your supervisors?

Andrew King is the technical one, and Reza Razavi is the clinical one.

Of all the incredible things you've done to get to where you are, what was the biggest difficulty you had to overcome?

I think it was the step of trying to make what I was working on work in a clinical setting and all the challenges, from getting the data from the back systems to applying it to make something the clinicians wanted to use. That was the most

challenging.

What forces did you find in yourself to overcome this challenge?

I guess it was the motivation. I really believed in the project. I thought it would be interesting. As I mentioned, I had a lot of collaborators who were very keen on helping and pushing – also, working very hard!

What's your secret?

I really believe in the projects I'm working on. I really think it will be something that can make a contribution, so I guess I have a lot of internal motivation. Also, I really like the imaging community and coming here for the conference and meeting with people.

If you had to select one achievement from everything you've done up to now, what would it be?

That's a very good question. Finishing my PhD was a big achievement, definitely. You work very hard for three or four years and at the end you have something which you can share with people and your family.

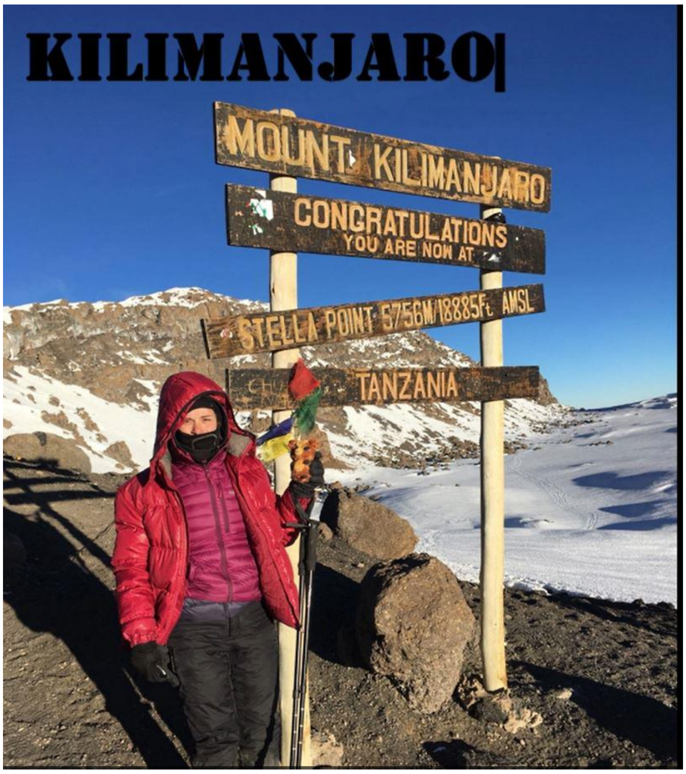
What did you do to celebrate?

I did two things. I decided that climbing Kilimanjaro in Tanzania was a good way to overcome the challenge! [*she laughs*]

You did?

Yes!

Wow!



Then, with friends and family, we had a small party all together.

What was most difficult, Kilimanjaro or making a PhD?

Both! [*we both laugh*]

Physically, Kilimanjaro, I guess intellectually, well... they are different!

What is your message to the community?

It's been a hard few years with Covid and everything, and it's really great to all be here again. I'm looking forward to chatting with everyone, getting to know each other again, and continuing to collaborate. I guess that's a positive message!

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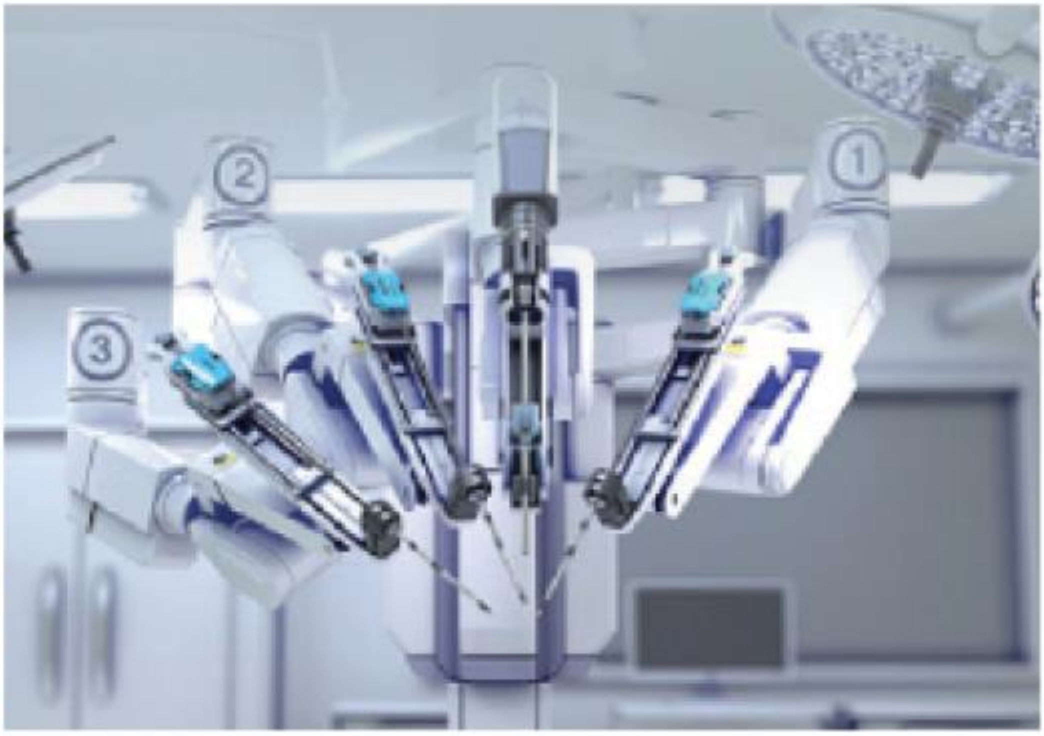

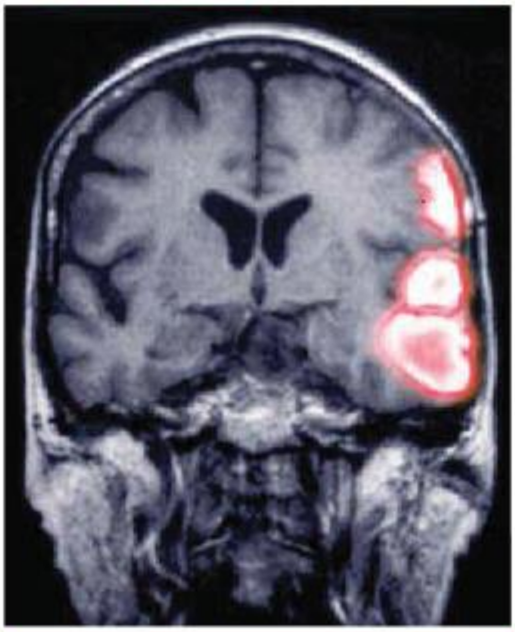

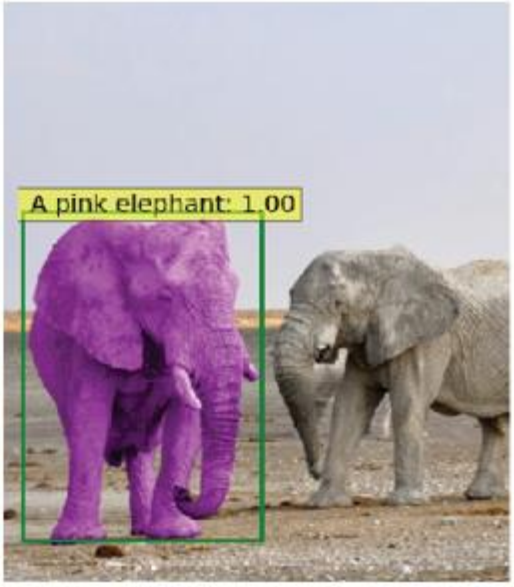

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