



# NEWSLETTER



WINTER ISSUE  
2025

Welcome to the GEMINI Newsletter, in which we introduce the project, update you on recent meetings, workshops and upcoming events.

**GEMINI - A Generation of Multi-scale Digital Twins of Ischaemic and Haemorrhagic Stroke Patients** - is funded within the HORIZON-HLTH-2023-TOOL-05-03 call - Integrated, multi-scale computational models of patient pathophysiology ('virtual twins') for personalized disease management - and officially started December 1st 2023.

If you want to be part of the journey, follow us on our social media and subscribe to our newsletter. A big thank you to all GEMINI partners and friends.

*Enjoy the read!*



<https://www.linkedin.com/company/dth-gemini>



<https://dth-gemini.eu/>

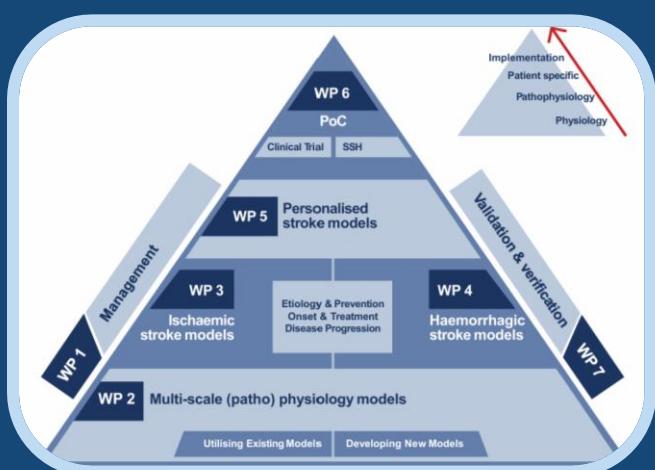


[Instagram](#)

# Project aim and description

GEMINI will deliver multi-organ and -scale **Digital Twins in Healthcare (DTH)**. This will improve understanding of and support treatment selection for stroke, addressing both **acute ischaemic and haemorrhagic stroke**.

The GEMINI project is organized in a pyramidal way, with higher work package (WP) numbers build upon the lower ones: WP3 and WP4 make use of the general (patho-) physiology models of WP2, WP5 uses the population-based DTHs to build patient-specific DTHs, whereas WP6 takes one of the patient-specific DTH to evaluate its value in clinical practice. Finally, all WPs interact with WP1 (project management) and WP7 (validation and verification).



Eighteen different institutes are involved in the project for a total of ~80 people.

If you are curious about the team you can visit the following link

<https://dth-gemini.eu/team/>



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# Some technical definitions

## In the previous number...

In the first number of the newsletter we saw the definition of **digital twin**. Check it at the following link

[https://dth-gemini.eu/wp-content/uploads/2024/08/Newsletter-1\\_final.pdf](https://dth-gemini.eu/wp-content/uploads/2024/08/Newsletter-1_final.pdf)

## Acute ischemic and haemorrhagic stroke and their treatments

An **ischemic stroke** occurs when a blood vessel in the brain is blocked, usually by a clot, preventing blood from reaching part of the brain tissue, while a **haemorrhagic stroke** happens when a blood vessel ruptures, often due to a brain aneurysm, causing bleeding inside or around the brain.

Treatments for ischemic stroke focuses on restoring the blood flow as quickly as possible, through **thrombolytic drugs** (which dissolve the clot) or **mechanical thrombectomy** (physically removing the clot with a stent-retriever, an aspiration catheter or a combination of both). For haemorrhagic stroke related to aneurysms, particular attention is given to unruptured aneurysms, whose treatment aims to prevent rupture. This typically involves **endovascular coiling, surgical clipping, or flow diverter implantation**, procedures designed to secure the aneurysm and reduce the risk of future bleeding.



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# News from the consortium

For our bi-annual meetings we are going around Europe! Last month (November 2025) we went to Geneva, where the meeting was organised by HUG. You can find photos and a brief description of the meeting at

**in** [https://www.linkedin.com/posts/dth-gemini\\_gemini-consortium-meeting-hug-hopitaux-activity-7399513935537934336-YyUq?utm\\_source=share&utm\\_medium=member\\_iOS&rcm=ACoAAETHRk8BfLJdL\\_3qZgUqOgco3fZwyaaRMhw//](https://www.linkedin.com/posts/dth-gemini_gemini-consortium-meeting-hug-hopitaux-activity-7399513935537934336-YyUq?utm_source=share&utm_medium=member_iOS&rcm=ACoAAETHRk8BfLJdL_3qZgUqOgco3fZwyaaRMhw//)



**Matteo Delucchi** (ZHAW) is the first GEMINI PhD student defending his thesis: 'Modelling evolution of the intracranial aneurysm disease by applying probabilistic graphical and machine learning aneurysm'

*Congratulations!*



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# Publications

## WP2

**Segarra-Queralt M., Molla M., Barrouhou M., Olivares A.L., Albors C., Bernardino G., Regueiro A., Mill J., Càmara O., Freixa X.** (2025) The Role of Anticoagulants After Left Atrial Appendage Occlusion. *JACC: Case Reports*. <https://www.jacc.org/doi/10.1016/j.jaccas.2025.105838>

## WP3

**Fregonà V., Bottini I., Barati S., Cervo A., Macera A., Schwarz G., Pero G., Piano M., Dubini G., Rodriguez Matas JF, Luraghi G., Migliavacca F.** (2025). Clinical image analysis to build patient-specific models of acute ischemic stroke patients. *Physical and Engineering Sciences in Medicine*, 1-11. <https://doi.org/10.1007/s13246-025-01646-7>

Nagargoje M.S., **Fregonà V., Luraghi G., Migliavacca F., Pero G., Rodriguez Matas J.F.** The role of friction forces in arterial mechanical thrombectomy: a review. *J Biomech.* 2025 Sep 16;192:112966. <https://doi.org/10.1016/j.jbiomech.2025.112966>. Epub ahead of print. PMID: 40972274.

Nagargoje M.S., **Fregonà V., Luraghi G., Migliavacca F., Poulos D.A., Good B.C., Rodriguez Matas J.F.** Impact of friction force and retrieval speed on in silico mechanical thrombectomies: A sensitivity analysis. *Comput Methods Programs Biomed.* 2025 Nov;271:109018. <https://doi.org/10.1016/j.cmpb.2025.109018>. Epub 2025 Aug 9. PMID: 40812230.

**Fregonà V., Luraghi G., Fereidoonnezhad B., Gijsen FJH., Majoie CBLM, Rodríguez Matas JF, Migliavacca F.** Impact of thrombus composition on virtual thrombectomy procedures using human clot analogues mechanical data. *J Mech Behav Biomed Mater.* 2025 Mar;163:106886. <https://doi.org/10.1016/j.jmbbm.2025.106886> Epub 2025 Jan 2. PMID: 39754893

## WP1

**Hoekstra A.G., Marquering H.**, on behalf of the GEMINI consortium. (2024). Towards a Generation of Digital Twins in Healthcare of Ischaemic and Haemorrhagic Stroke. In: Franco, L., de Matalier, C., Paszynski, M., Krzhizhanovskaya, V.V., Dongarra, J.J., Sloot, P.M.A. (eds) Computational Science – ICCS 2024. ICCS 2024. Lecture Notes in Computer Science, vol 14834. Springer, Cham. [https://doi.org/10.1007/978-3-031-63759-9\\_29](https://doi.org/10.1007/978-3-031-63759-9_29)



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# Congress attendance and presentations

In the last months the GEMINI team participated to many conferences presenting their research to a wide range of audiences, from scientists to clinicians, engineers or statisticians.

Here's the most attended conferences:

- People from EMC, HUG, POLIMI and UvA presented their work at the **19th International Symposium on Biomechanics in Vascular Biology and Cardiovascular Disease** in Rotterdam, The Netherlands in May 2024. This symposium was organized by the partner EMC
- People from AMC, BME, UvA and ZHAW presented their work at the **8th International conference on Computational and Mathematical Biomedical Engineering (CMBE2024)** in Arlington, Virginia, USA in June 2024.
- People from EMC and NTU presented their work at **29th Congress of the European Society of Biomechanics (ESB2024)** in Edinburgh, Scotland in July 2024.
- People from AMC, POLIMI, UPF presented their work at **the 8th International Conference on the Virtual Physiological Human (VPH2024)** in Stuttgart, Germany in September 2024.
- People from POLIMI and ZHAW presented their work at **47th IEEE Engineering in Medicine and Biology Society (EMBS)** in Copenhagen, Denmark in July 2025.
- People from TUD presented their work at **EuroMech Colloquium** in Graz, Austria in August 2025.
- People from POLIMI, Sano, UPF presented their work at **20th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering (CMBBE 2025)** in Barcelona, Spain in September 2025. This symposium was organized by the partner UPF
- People from UNIGE presented their work at **25th EANS annual congress** in Vienna, Austria and at **17th ESMINT meeting** in Marseille, France in September 2025.



For details about the presentations, photos and more, check out our LinkedIn page



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# Future congress suggestions

- The **21th International Symposium on Biomechanics in Vascular Biology and Cardiovascular Disease** will be held on the 18-19 June 2026 in Geneva, Switzerland and EMC and HUG will be among the organizers. Check here for information: <https://shearstresssymposium.nl/>
- The **9th International Conference on Computational and Mathematical Biomedical Engineering (CMBE2026)** will be held on 22-24 June in Kobe, Japan. **The deadline for abstract submission is 16th February 2026.** Check here for more information: <https://compbiomed.net/CMBE/cmbe2026>
- The **10th World Congress of Biomechanics** will be held in Vancouver, Canada on 11-15 July. The abstract submission is already closed. Check here for more information: <https://wcb2026.com/>
- The **17th World Congress on Computational Mechanics and 10th European Congress on Computational Methods in Applied Sciences and Engineering (WCCM-ECCOMAS2026)** will be held in Munich, Germany on 19-24 July 2026. A mini-symposium on thrombus mechanics (MS332) will be organized by Behrooz Fereidoonnezhad (TUD), Giulia Luraghi (POLIMI) and Frank Gijzen (EMC, TUD). **The deadline for abstract submission is 12th January.** Check here for more information: <https://wccm-eccomas2026.org/>
- The **9th International Conference on the Virtual Physiological Human (VPH2026)** will be held in Milan, Italy on 1-4 September 2026. It will be organized by POLIMI. **The deadline for abstract submission is the 2nd March 2026.** Check here for more information: <https://vph-conference.org/>
- The **12<sup>th</sup> ESOC congress** will be held May 6-8 2026 in Maastricht, The Netherlands. <https://eso-stroke.org/esoc2026/>. The abstract deadline is January 7<sup>th</sup> 2026.



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Zurich University of Applied Sciences





# Happy new year!



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