

# Impact Report & Potential Game Tilly




Gaming for cancer  
research. From idea,  
to impact, to scale

April 2026

**ChangeGamers**  
samen gamen voor kankeronderzoek



# Preface




The journey to develop a game to accelerate data collection to advance cancer research started several years ago. Initially, as potentially interesting idea that with the help of some initial funding we managed to test on a very small scale. The results however confirmed we were on the right track. This first evidence was enough for Vodafone Foundation, Tanka, HC Schaap and AVL Foundation to support our gaming initiative. This support has been instrumental as it allowed us to grow from first concept into a working prototype of the game. The prototype allowed us to attract a substantial community of players and collected a large amount of valuable data. Based on these results we can now convincingly say that gaming together creates serious impact. It can help solve a major bottleneck: the lack of data for AI development in pathology. Plus, the game proves to be a valuable channel to bring society and research together. Thanks to our partners, we are now ready for a next phase: professionalizing the game to collect annotations at the scale needed to train AI for TIL quantification in breast cancer. This opens the door to matching patients to trials that add immunotherapy or safely omit chemotherapy based on their TIL profile. Scaling the game is the next step toward making immunotherapy accessible to every eligible patient in the Netherlands.

In this impact report we will highlight the results of the past year and, in part two, explain the enormous potential the game has to push the boundaries of scientific research. We would like to thank our partners for the crucial support and patience and are looking forward to yielding the impact we created together. Game on!

The ChangeGamers

# Introduction



**The disease of cancer is at the center of our society. Whether we like it or not, we have to confront it. Nearly half of us will get the disease ourselves during our lifetime, but in any case, everyone will encounter a case of illness in their immediate circle. It leads to feelings of powerlessness and the desire to make a difference: what can I do?**

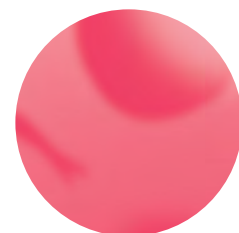
ChangeGamers provides people this opportunity to fight cancer. Simply by playing an easy cell game anyone can help collect valuable data for cancer research. The game is educational and fun, but more importantly: it provides crucial data for research into immunotherapy using artificial intelligence, in which Antoni van Leeuwenhoek (AVL/NKI) is a pioneer. After two years of testing, proof of impact has been provided by the AVL research group of pathologist Hugo Horlings. The group submitted a publication to the medical journal Scientific Reports and that has been accepted. The main conclusion is that players together (6 in total) are just as skilled in recognizing different cell types as a pathologist. An algorithm that has been trained with data from the game is virtually as accurate (82%) as that of experts (83%). The effectiveness of both algorithms is now being tested in two trials to determine the extent to which they help predict which patient with triple-negative breast cancer is eligible for immunotherapy. The goal is to ensure that every patient in the Netherlands who would benefit from this receives this promising therapy.

The conclusion that playing Tilly together makes impact cannot be underestimated. It implies that everyone can contribute in an accessible way to solving a major problem in cancer research: the lack of these cell annotations. This is a task that pathologists simply do not have the time for, and this hinders the development of two promising and mutually reinforcing developments: immunotherapy and the use of AI in diagnosis.

What more, research among the player community conducted by a team of Erasmus University (results can be provided on request) has shown a societal need for an action perspective in the fight against cancer. The game proves to be a meaningful channel for this, more so than we had anticipated. People want to use the game to make an impact on cancer research that is the number one motivation to play. In addition, players want to learn about research, the body, and AI to understand the disease better, which is an important second motivation to play. The game thus offers a unique platform to bring science and society together around

**‘It is not a playful subject. On the other hand, it is presented in a playful way, so that makes it fun and accessible.’**

Vodafone employee



**‘I participated in collecting data to feed AI. It seemed interesting to me to contribute a little bit to this technology.’**

player AVL panel



two revolutionary fields of research. This is also evident from the invitation from Lowlands Science to host an interactive game during the festival in Biddinghuizen.

These important results open doors to think differently about this data and the development of algorithms. Even a small increase in players means a multitude of data that was previously unavailable. Plus, new tasks can be added to the game for which there was previously no time: new cell types, their location, and data from different sources, which is expected to improve the accuracy of algorithms. This leads to interesting new scientific questions, and we are eager to add them to the game.

In this document, we first describe the impact we achieved in the past two years. The second part of this document outlines the enormous potential of playing together for research into AI and immunotherapy. Based on 3 new hypotheses and the steps we intend to take to utilize this potential. We are very grateful to our partners for their support. Without their help and patience, we would never have been able to achieve these important results. We hope to continue growing together to utilize the full potential of the game Tilly. With each other and for each other. Game on!

# Section one: impact report game Tilly

Over the past 2 years, we at ChangeGamers have worked on proving an important scientific hypothesis: can non-experts using a game collaboratively annotate cells just as well as a pathologist? We can now answer this with a resounding 'yes', resulting in a solid publication. The publication is titled '*Crowdsourcing enables robust cell annotation for breast cancer pathology*' and has been accepted by the scientific journal Scientific Reports.

Aside from valuable scientific data, we gained many crucial insights regarding the motivations of the player community with the help of Erasmus University and lastly, we learned valuable lessons about the gameplay and mechanics. It is precisely these lessons that make us look to the future with great confidence: people want to contribute and learn about research, and the game proves to be a unique channel for this. Below, we briefly share the most important lessons and insights regarding data, community, and the game.

## Amount of data

In 3 test rounds of one week each, called Tilly Challenges, with a community of a total of 450 players, the game Tilly collected over 450,000 annotations, distributed across 3 cell types. Namely: immune cells, tumor cells, and fibroblasts. To put this in perspective: a pathologist approximately does 500 annotations in an hour. Naturally, a weighted average is taken of the total player data (consensus score of at least 6 players), which is still impressive in terms of quantity. Moreover, since the differences between pathologists were greater than expected, for this reason a consensus score is also used for experts (minimum 5).

## Data quality

Qualitatively speaking, non-experts scored approximately the same as experts. Only the score for fibroblasts was lower, although this cell type was also recognized moderately by experts. Moreover, a built-in algorithm in the data infrastructure ensures that every image in the game (8000 in the third round) is sufficiently annotated (7-19 times). Optimizing the data collection to allow an algorithm to be with a high degree of accuracy. As mentioned, virtually as accurate as that of experts.

## Tilly community

Finding a substantial test community of players was not the challenge. Within a few days and with minimal marketing, we were able to build a community for every test round. For this, we primarily used channels

**Tumor cells:**  
Non-experts 89%  
Experts 91%

**Immune cells:**  
Non-experts 87%  
Experts 87%

**Fibroblasts:**  
Non-experts 39%  
Experts 42%

**Algorithm:**  
accuracy  
Non-experts 82%  
Experts 83%

via AVL, AVL Foundation, Ziggo/Vodafone, and KWF. In total, over 450 people played the 3 Tilly Challenges (including many loyal players). Almost all players had somehow been affected by cancer, either personally or in their immediate circle. Research by Erasmus University among players (results can be shared on request) confirms that there is a great need for an action perspective in the fight against cancer, driven by feelings of powerlessness and a desire to make a difference. Plus, people want to learn about research and AI. Showing the potential for the game to bring together society and cancer research. Naturally, in the collected feedback sufficient areas for improvement were mentioned in game play, information and lessons. That said, we can build on the potential of 3 most important motivations for people to play the game. These are:

Contributions: making an impact through the game to help develop:

- Cancer research
- AVL, giving something back
- Technology

New knowledge: players indicate that they find the learning aspect of the game important. Players want to learn:

- about cells and the human body
- about research into immunotherapy and AI
- about AI and how it can be used

Collaboration: the game (and WhatsApp Community) ensures that players experience the following:

- Teamwork (sense of community)
- Stimulation (motivation from doing it together)
- Educational (being able to ask questions)



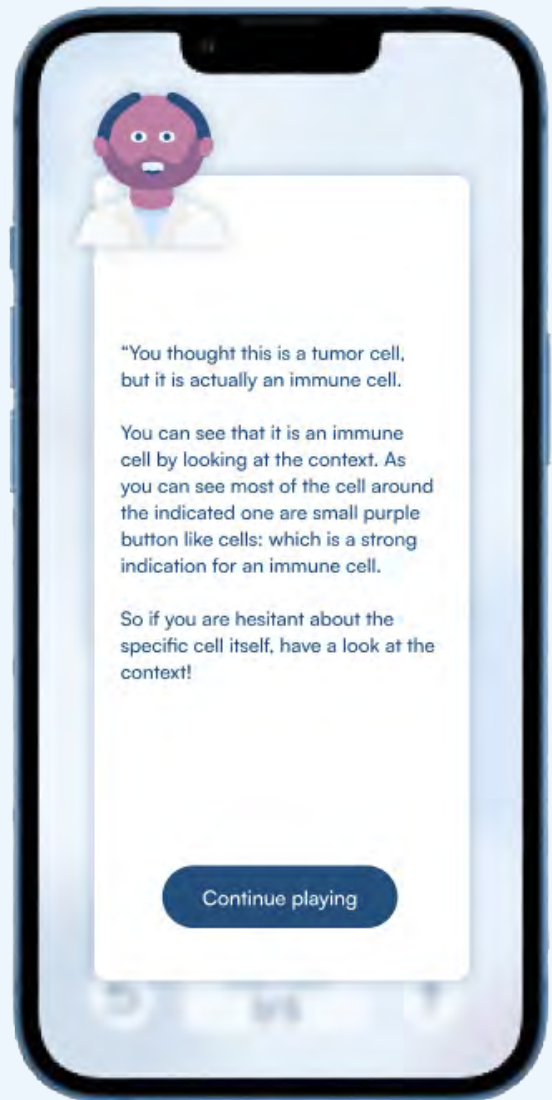
### Game Tilly

Although the game is still a simple prototype, within three test rounds it developed in a stand-alone game that ran smoothly. Gameplay was clear, Tilly as name and objective was understood, players progressed and many finished the game within the week. For each test round we added new elements to the game. The choices for this were made based on the feedback we received from players during and after (via survey) each Challenge. It allowed us to understand and test what works and motivates players to continue. Based on these lessons we see a huge potential for further professionalizing the game. In general, it can be stated—and we have made progress in this area per test round—that motivation is increased by:

- Training: players quickly understood the basic information and recognized the shapes of the three cell types
- Extensive learning module: players want a lot of information about the characteristics of the cells and what this means for the research
- Simple gameplay: gameplay must primarily facilitate the accurate recognition of cells
- Feedback and progress: feedback and personal progress in better cell recognition motivates players to contribute as much as possible
- Collaboration and possibility to ask questions: players feel the need to consult with each other and with the expert (online and offline) about the game and research

### Backend

Another important achievement is that the NKI -AVL computational team together with the Cloud Competence Center have developed a smart data infrastructure to optimize data collection with the game. The whole flow of data from image selection, testing, annotating, cleansing, analyzing, storage and feeding the data into a model has been automatized. This flow contains an AI tool that ensures that each image in the data set get labelled in the game equally which is essential to optimize the development of these models. The conclusion of this is that the infrastructure is ready to scale up in number and variety if images.

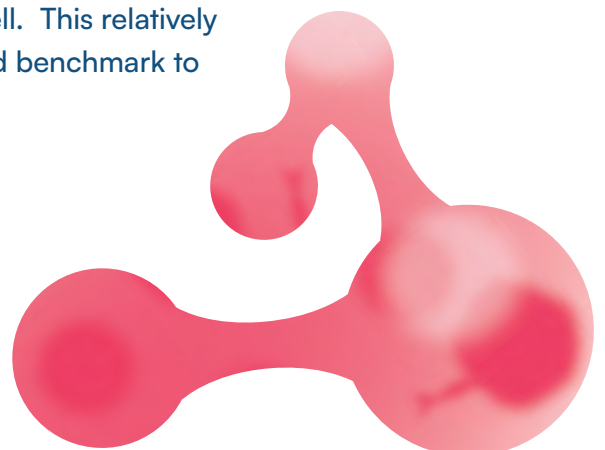




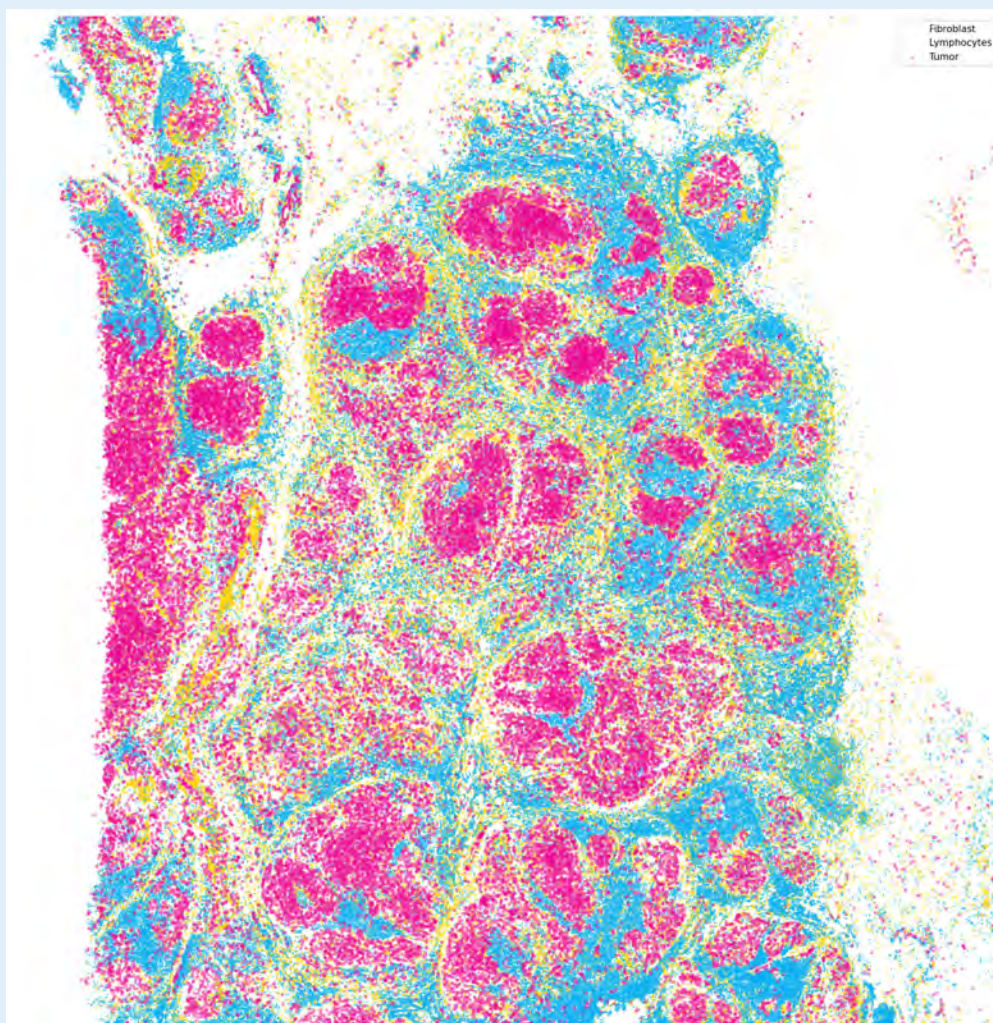
### Ground truth data

How can we tell an immune cell is really an immune cell? An important question as it is the foundation of any model: what is the ground truth? The answer to this obvious question is more complicated than one would think. This is probably the most important lesson we learned with game Tilly. The challenge that we encountered is that there is no single solution to developing a ground truth and that a combination of data sets and techniques are needed to create a robust foundation for the model. We expect that in the development of many models this critical aspect is underestimated. The game provided an excellent channel to optimize this using a combination of labelled and unlabeled data annotated by experts and non-experts. Allowing data scientists to benchmark all the different datasets against each other afterwards. We took the following steps:

- Benchmark non labeled data - In the game we benchmarked the annotations against labelled data that have been extracted by an innovative technique called CODEX. CODEX enables a deep view into the single-cell spatial relationships in tissues using protein markers that attach to specific cell types. It is highly accurate, yet not 100% waterproof, plus, it is an expensive technique. Yet, we managed to collect a sufficient data set of CODEX data to benchmark against.
- Use the crowd for bulk of annotations — the community of players helps collect a massive number of annotations equally distributed over the 8000 labelled images that we used for the last challenge. The labeled data is treated as unlabeled, meaning that the crowd together (6 in total) provides a consensus score to what the cell type in the image is. This score can afterwards be benchmarked against Codex to check any conflicting answers
- Pathologists perform an extra check — we asked multiple pathologists to annotate 1000 images from the data set. Five in total to avoid a bias and create a consensus score as well. This relatively small data set creates another important check and benchmark to increase the overall ground truth



# Impact result: training the algorithm

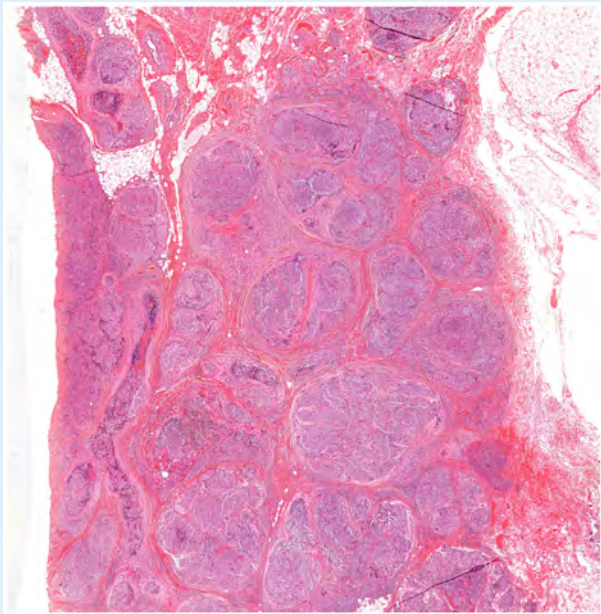


*Weather map trained with public data*

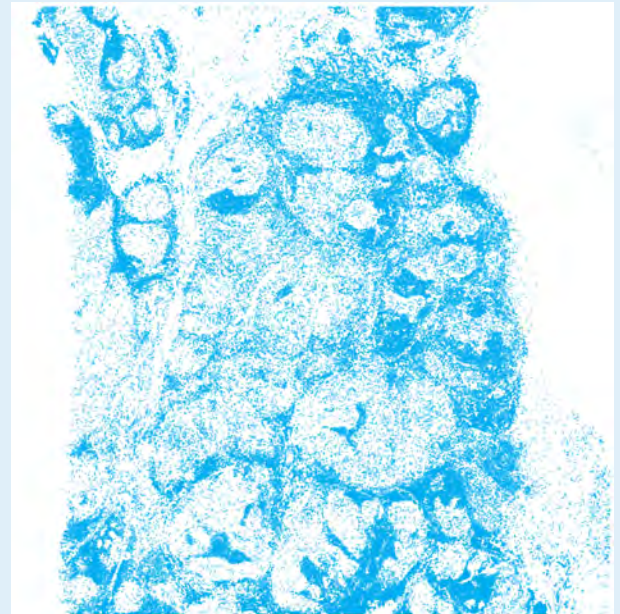
How does AI in pathology work? In the image above, the algorithm trained with ‘public data’ has been overlaid on a biopsy of a breast cancer patient. The algorithm has been trained to recognize immune and tumor cells, as well as fibroblasts, and the model effectively creates a ‘weather map’ of these three cell types. This heat map makes it immediately visible where (context) and how often (numbers) the cell types occur—something that is much more difficult to observe with the naked eye through a microscope. The model has been trained with an accuracy of 82%, comparable to other models. The predictive value is currently being tested within two trials. In any case, it is

a unique achievement: a model trained with data collected by non-experts using a game.

The reason to start with these three cell types is that they are considered the most relevant for increasing the predictive value of the model. The number and location of immune cells relative to tumor cells are important indicators for determining which triple-negative breast cancer patients will benefit from immunotherapy. If immune cells are well distributed throughout and around the tumor, as can also be seen in the image, the chance of immunotherapy being effective is high. The explanation behind this is that the tumor is less able to defend itself, and consequently,



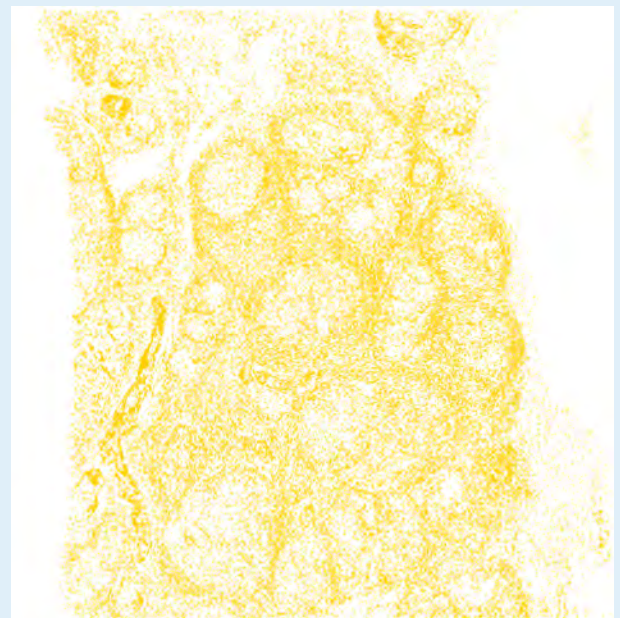
*original H&E slide*



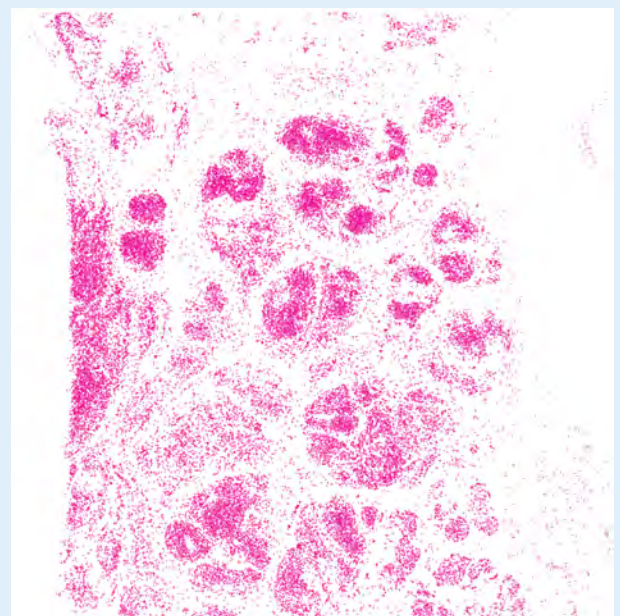
*Immune cell (lymphocyte)*

immune cells appear better able to attack and eliminate the tumor cells with the help of the therapy. Fibroblasts, which are support cells, in the vicinity of immune cells indicate something about the 'strength' of these immune cells, as they appear to be supported by fibroblasts.

In short, AI in pathology makes patterns visible to a pathologist that are more difficult to distinguish with the naked eye. This uncertainty leads to immunotherapy being used suboptimally. For example, a recent study by Group Horlings shows that the quantity of tumor-infiltrating lymphocytes (TILs) proves to be an important marker whether immunotherapy is effective in a patient. A TIL means that an immune cell (lymphocyte) is touching (infiltrating) a tumor cell, indicating it already attacking it. Manual assessment of a biopsy containing 1.5 million cells is too time-consuming and subject to variability among pathologists. The group has demonstrated that an algorithm can automatically detect and quantify TILs in histopathological images and generate a TILs score based on this. However, to train these models accurately, large amounts of annotated data are needed that are currently unavailable.



*Fibroblast*



*Tumor cell*

# Section 2: the scientific potential of Game Tilly



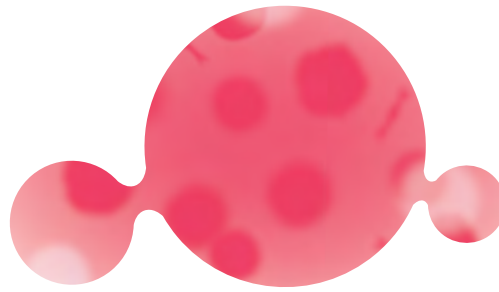
## Information in our cells

Our body consists of 37 trillion cells, divided into 200 cell types, each with its own function, which work closely together to keep our body functioning and healthy. Scientists foresee that a better understanding of this interaction between cells will lead to new groundbreaking cell therapies in the near future and the strengthening of existing treatments, such as immunotherapy. Achieved, among other things, with the help of accurately trained AI.

So, what constitutes a better-trained algorithm? How can accuracy be increased? That is an important question to answer. A possible answer to this lies in developing models that better understand the interrelationships between our cells, allowing it to highlight more patterns. In principle, every cell type on the biopsy provides information about how the body and the tumor will interact, the quantity of specific cells as well as their position. For instance, the breast alone is constructed of 20 different cell types, distributed across 1 to 2 million cells on a single biopsy. It is impossible to view all possible patterns with the human eye.

The challenge remains that a lot of data is needed to train a model. In our case, at least 200,000 annotations for 3 cell types (the optimum is a subject of debate). For this reason, algorithms are often trained with minimal numbers and cell types as there is simply no time or money to collect more data. As a result, the training of a model is done with minimal and homogeneous datasets, which increases the risk of bias. This is further exacerbated by the fact that the differences between pathologists are greater than expected. Now that it has been demonstrated that non-experts can annotate cells together just as well as pathologists, this offers new ways to think differently about data collection and model development along the following 3 lines:

- Number of cell types — in principle, every cell type can be annotated in the game
- Context — mapping location and thereby interaction between cells
- Differentiation of data sources — optimizing the mix of data (heterogeneity) can increase the ground truth: differentiating datasets (geographic, population, technology (scans and staining)), collecting bulk data with the game, more specific data annotated by multiple experts, tested against Codex lab data.



## **The State of AI in Pathology**

The lack of annotations remains a challenge for the development of AI within pathology. This is not to say that the field is not developing rapidly. Worldwide, many scientists and companies are working on developing smart and accurate models that are already used in clinical settings. Nevertheless, it can be stated that the revolution is progressing much slower than could be expected. Lack of data and a shortage of pathologists continue to be major hurdles.

The game could become a valuable source for data collection without overburdening pathologists. We believe it can contribute to the development of AI in a scientifically open and transparent manner, benefitting science and society equally. Below are the key arguments:

- Each model requires data, demanding significant capacity from pathologists. Globally, there is already a shortage of pathologists
- Models are therefore trained on minimal and often homogeneous datasets, assessed by often a single pathologist
- Our research shows that the underlying ground truth is consequently not robust enough (risk of bias)
- Moreover, a plateau phase of 80-90% accuracy emerges. This may indicate a limitation of the human eye (more differentiation in data sources)
- An alternative is so-called Codex data. These are lab data in which a unique protein binds to a specific cell type on the biopsy. Our research has shown that these are not infallible either. Plus the method is expensive
- A second alternative is the development of foundation models developed by commercial parties. These models consume a lot of energy and are expensive to develop and use
- There is often a lack of transparency and collaboration in the development of these models

Next phase Game Tilly: more players, more data, more impact


What happens to the predictive value of a model when it is trained on all 20 cell types in the breast? How much more health benefit would this yield? And perhaps even more importantly: how much misery and pain could it spare patients? These are no longer hypothetical questions, but ones that we could help answer by playing Game Tilly. That is the future we envision as ChangeGamers.

A future we would like to grow towards together with our partners. A sustainable model featuring a public game where we feed various studies, cell type by cell type, with a growing community of players. To achieve this, it is necessary to lay an even stronger scientific foundation based on 3 new hypotheses. Secondly, to use these hypotheses to make the game more challenging and robust through various tests, so that the game can retain more people for a longer period. From here, to grow into a community of 1,000 - 2,000 regular players and a continuous stream of data. The demand is there, from the community and organizations, as confirmed once again by our participation in Lowlands Science. A opportunity to introduce the public to the research in a playful way by playing a game. An interactive festival variant in this case.

For this reason, ChangeGamers needs new funding in the coming year. The goal is to convert the value created by the game into a sustainable organization that grows the game, impact, and community through new scientific research. In this second part of the document, we explain this strategy, starting with the science.



# Scientific goals: 3 hypotheses



Now that it has been proven that playing the game yields valuable data, the goal is to differentiate the data collection by broadening the context and number of cell types within the breast. The differentiations is based on 3 new hypotheses with the aim of investigating whether this leads to a stronger foundation (ground truth) for the algorithm and, consequently, the performance of the model.

## **Hypothesis 1 — Multicellular context and architecture**

Explicitly annotating multiple relevant cell types in breast biopsies, including their spatial organization and degree of architectural disorganization, improves the performance of the overall algorithm. This contextual information makes it possible to distinguish between normal tissue and tumor and enables stronger associations with survival and response to immunotherapy in Triple Negative breast cancer patients.

### Rationale

- Pathologists recognize tumors not only by which cells are present, but by how they are organized.
- Disorganization (loss of normal architecture, chaotic interactions between epithelium, stroma, and immune cells) is a core characteristic of malignancy.

## **Hypothesis 2 — Cell type diversity, composition, and clinical relevance**

The more of the approximately 20 known cell types in breast cancer that can be reliably distinguished, the better the diversity, composition, and spatial interactions of the tumor microenvironment can be quantified. This richer representation enables stronger associations with survival and response to immunotherapy.

### Rationale

- Immunotherapy response does not depend on a single cell type, but on: composition (who is present), ratio (how many), and spatial context (location relative to the tumor).
- AI models demonstrably benefit from fine-grained cellular analysis instead of binary labels (tumor vs. non-tumor).

## **Hypothesis 3 — Strengthened ground truth through heterogeneous sources**

Combining labels from multiple sources (experts, citizen scientists, different cohorts) strengthens the ground truth, reduces individual bias, and makes the model more robust to variation in tissue architecture and cell composition.



## Rationale

- The recognizability of cell types in a biopsy varies due to differences in staining, scanning equipment used, and cohort characteristics. By differentiating annotations by source and expertise, conflicting assessments can be systematically weighted.
- Applying a weighted aggregation method minimizes the impact of individual deviations and leads to a more reliable and consistent frame of reference for model training.

## Development of the game Tilly

We see many opportunities to integrate the new scientific tasks into the gameplay of Game Tilly. It allows us to make the game more versatile and challenging, for which there is a great demand from the player community. And to grow to the next phase, both qualitatively and quantitatively. Moreover, the smart data infrastructure developed within AVL is ready for this.

In the coming year, through various tests, we aim to add the following elements to the game, among others:

- 8 cell types - In total, we want to add 8 extra breast cell types next year, on top of the 3 already existing cell types. The recognizability of the cell types varies in difficulty, yet, they all have unique characteristics. As a player's skill level improves, they will be presented with more difficult cell types. The 'weight' of players is determined by an algorithm built into the infrastructure that compares it against Codex data and the average.
- Spot the cell for context - Additionally, we will work with 'spot the cell' within the game, an additional gameplay element to challenge people to interpret context. Previous tests have shown that this will work, partly because it taps into a human strength: people intuitively recognize patterns, chaos, and structure. Based on game logic,

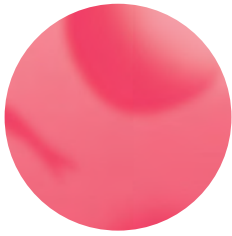
questions can therefore be asked such as: Is this organized or disordered? Do these cells appear to be working together or are they chaotic? Is the immune system close by or far away?

- Smart learning module — developing a more versatile game with smart and interactive learning opportunities means that we can bind a larger community of players to us for a longer period. This module will be rolled out via the game, website, and player forum. It will challenge players to constantly improve themselves, on the way to becoming a citizen pathologist. It will lead to more involvement of the community into the research as we make them part of the development of AI and immunotherapy.
- Continuous play — We will alternate between short Challenges and continuous play. Through Challenges, we can recruit new players and collect a bulk of data for the easier cell types. Continuous play allows to really engage with the player for a longer period and make the player part of research by increasing the difficulty of the tasks, differentiating the data collection. Using both strategies, we aim to grow into a stable community of 1,000 — 2,000 players. A quick calculation shows that if we can challenge these players to collect 1,000 to 2,000 cells every 2 months, this will lead to a total of between 1 and 4 million annotations on an annual basis. This is a conservative estimate and assumes limited marketing, not yet a public launch.

### **Social impact: bringing society and research together**

Behind the expansion and professionalization of the game lies a long-term strategy to improve access to diagnosis for everyone by bringing society and research together for social impact. The game is a unique channel to playfully take players into the world of cells. A cell is tangible; after all, we are our cells. And at the same time, a cell is invisible. Many Tilly players will consciously encounter a human cell for the first time while playing the game. This presents a unique opportunity to explain to players the functions of cells, the information they provide, how this leads to a diagnosis, and how AI can help improve the diagnosis.





Research by the Erasmus University team shows that this information helps the player community talk about cancer in a different way, reflect on their own bodies, and from there better understand how research into cellular therapy, such as immunotherapy using AI, works. Ultimately, this helps a patient ask better questions and process information better in the consulting room. AVL oncologist and researcher Marleen Kok, involved in this study, regularly speaks about the challenge of explaining a diagnosis to people in the short time she has for each patient—a result that often has a dramatic impact on these people's lives. For this reason, she says, an informed patient helps to arrive at a well-founded treatment plan together. This conclusion is supported by the research of Fong et al. Fong demonstrates that improved communication between doctor and patient results in greater patient engagement, which helps to increase adherence to therapy and improve the quality of care and health outcomes. The effect of this is amplified when patients are better informed about their own health, body, and specific therapies. Better access to this information would thus reduce health inequality.

An additional challenge is that access to promising new therapies is not the same everywhere. Where you are admitted in the Netherlands is a major determining factor in which treatment options are available, and that is just within the Netherlands. On the one hand, this research ensures, via a national network, that the models being trained become available to all pathologists in the Netherlands. On the other hand, it would help if, eventually, patients themselves also dared to ask what their TILs score is and how their immune cells compare to cancer cells. We believe that in the near future this could be a normal question, contributing to making immunotherapy available to all eligible patients in the Netherlands.

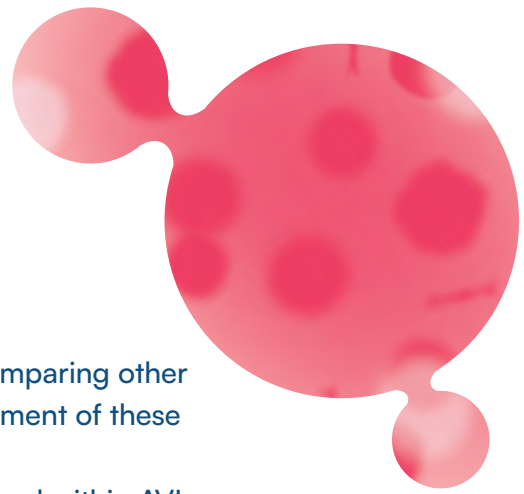
### **ChangeGamers Value Model**

The recent period has shown that the game Tilly has developed value on many different levels: for research, for society, businesses, and organizations. With the new hypotheses, we aim to better substantiate this value. Nevertheless, ChangeGamers anticipates that the coming year will yield concrete results for science, community, our partners and our own game and organization. Below the most important results:

#### **Science:**

- Data room and dashboard — user-friendly access to millions of data points distributed across 11 cell types and available for scientific research from various sources (game, expert, codex).





- AI - new models available for testing, training, and comparing other models, increasing learning capacity and the development of these models.
- Data infrastructure - smart data infrastructure developed within AVL, including an AI algorithm that can be deployed for other research groups
- Implementation - national network from AVL for the use and implementation of AI models

### **Community:**

- Sense of impact — the ability of society to contribute to cancer research, scaling up together to 2 million annotations
- Society and research - with 2,000+ players, the sense of community and contributing together will grow. It will be an important channel to engage this group and society at large in research
- Education and information — smart learning module will help player community to understand immunotherapy and AI better. Module will be used for educational campaign at schools and universities as well
- Healthcare - contributes to more informed people and patients

### **Partners:**

- PR - taking on a societal role in the fight against cancer in an innovative way (visibility on festivals, schools, universities)
- Purpose - Involving employees/patients and their families in a common goal in the fight against cancer
- Trust — for hospitals and research centers it helps to involve people in their research. Increasing the information and trust in the organization

### **Game:**

- Public launch - Proven game ready for (inter)national public launch
- Research - generating data for multiple (international) studies
- Organization - independent organization to manage game platform

### **Revenue Model and Financial Plan**

Building upon the value proposition outlined above, we will develop a sustainable financing model over the next two years comprising four complementary streams, all aimed at further developing and strengthening both the Tilly platform and ChangeGamers as an organization.

Before ChangeGamers can work towards a sustainable revenue model, it wishes to strengthen all components first. This includes achieving a robust

Hello, my name is Tilly the algorithm. Will you help me get smarter?



game that is publicly downloadable via the app store. To this end, we are seeking additional (scientific) grants for the coming two years to help ChangGamers grow to a sustainable organization and generate revenue from the 4 complementary streams. We foresee the following potential financial streams:

- Institutional licenses: other cancer centers and academic medical centers deploy the Tilly platform, including the game and backend infrastructure, for their own research.
- Licenses for annotations; anonymized datasets are licensed to academic research institutions and, where permitted, companies.
- Co-financing of research grants: Tilly is positioned as a shared infrastructure for engaging society in science within multi-institutional grant applications, including NWO Open Science and ZonMw, in collaboration with TU Delft, NKI-AVL, and other academic hospitals. This funding stream finances staff and platform development within grant budgets. This immediately reduces operational costs.
- Education — training programs, workshops, and teaching modules for medical professionals, patient organizations, companies, students, and pupils.

Full transparency is central to all programs: citizens are clearly informed about how their contributions are used, with consent and trust at the heart of everything Tilly does.

### **In conclusion**

If 10,000 players worldwide were to play the game Tilly every month, that would mean the game generates at least 10 million annotations every month. With a public game, this is not an unthinkable number of players. Certainly not given the enthusiasm in society to contribute to cancer research. It would provide unprecedented nourishment for science and could thereby revolutionize AI development. Ensuring that new groundbreaking therapies reach the right patients. Not wishful thinking, but a realistic goal. With the help of our partners, we can be ready for this within a year. Together and for each other. Isn't that what we're aiming for?

On behalf of all ChangeGamers we want to thank our partners for making Tilly's journey possible. We are looking forward to the starting a new chapter. Game on!

# Team ChangeGamers

ChangeGamers aims to bring together citizens, medical professionals, and AI specialists to conduct research and education on Artificial Intelligence (AI) and, secondarily, immunotherapy, with the goal of improving patient outcomes and quality of life. For more information, see [www.changegamers.nl](http://www.changegamers.nl)

The following team worked together on making Tilly the Game a success

- Hugo Horlings — lead investigator and pathologist NKI-AVL
- Samuel Ding — Cloud Competence Center NKI-AVL
- Bart de Rooij — data analyst NKI-AVL
- Rolf Harkes — Imaging Scientist & Biolmage Analyst NKI-AVL
  
- Sophie Wartenbergh — social designer
- Siamak Hajizadeh — senior AI scientist
- Laurens Pels — storytelling and communications
- Ernst Lurling — developer
- Jeroen de Bruin — UX expert

## Partners:

- AVL/NKI
- AVL Foundation
- KWF
- Tanka
- HC Schaap
- Vodafone Foundation
- TU Delft
- AICON/ Erasmus University

## Contact

Interested to partner or to learn more? Please don't hesitate to contact us. We are happy to answer your questions. See the contact details below

email: [l.pels@nki.nl](mailto:l.pels@nki.nl)  
phone: +31 619 206 238