

Application-oriented research: What is it, who does it, and why?

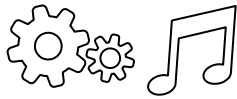
Estefanía Cano

MIP-Frontiers

Universidad Pompeu Fabra – Barcelona
May 20, 2019



Who is Estefanía?



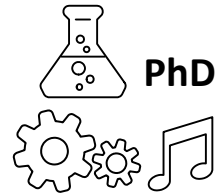
Colombia

UPB/UdeA



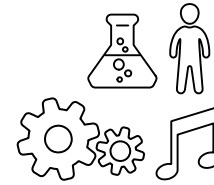
USA

UM



Germany

Fraunhofer
IDMT

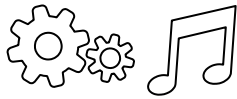


Singapore

A*STAR.



Who is Estefanía?



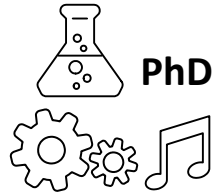
Colombia

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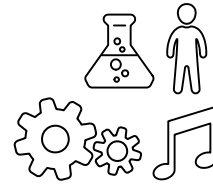
USA

UM



Germany

Fraunhofer
IDMT



Singapore

A*STAR.



My current research topics

- Sound Source Separation - PhD
- MIR for music education - PhD
- MIR for computational musicology and archives – Postdoc
-



What is application-oriented research?



BASIC RESEARCH

Answer fundamental questions to expand knowledge

Understanding fundamental principles with no immediate commercial objective

Leads to new technologies

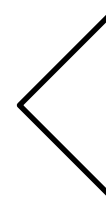


APPLIED RESEARCH

Answer specific questions to solve practical problems

Knowledge for specific commercial objectives: new technologies, products or processes

Leads to new fundamental questions





Who does it?

Fraunhofer Society Germany



A*STAR Singapore



AIST Japan



NarLabs Taiwan





Application-oriented research

BUT WHY?



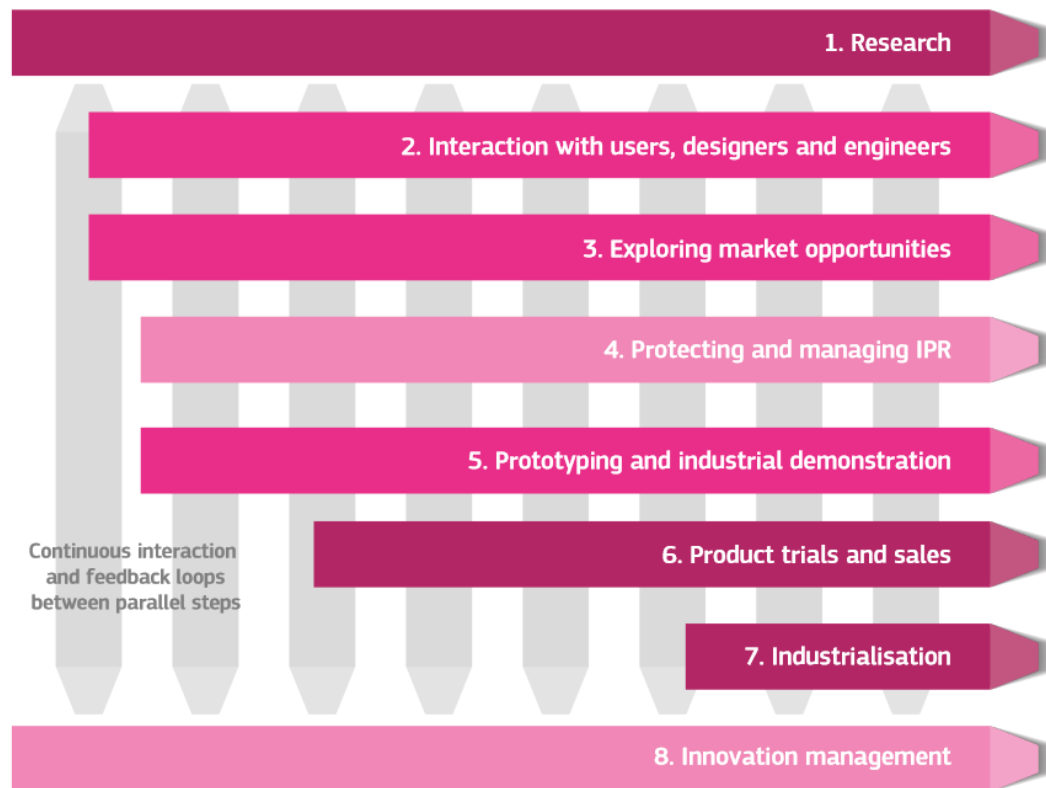
Why application-oriented research?

European Paradox: “a strong science base but weak innovation performance (exploitation)” [1]

[1] European Commission: **Green paper on innovation** (1995)
http://europa.eu/documents/comm/green_papers/pdf/com95_688_en.pdf[Accessed 20 May 2019].



Why application-oriented research?



Innovation Pathway

[2] **European Commission.** *Innovation: How to convert research into commercial success story? Part III.* (2013)
https://ec.europa.eu/research/industrial_technologies/pdf/how-to-convert-research-into-commercial-story_en.pdf [Accessed 20 May 2019].



How does it work?

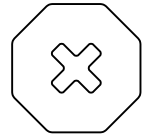


How does it work?

Industry



Problem



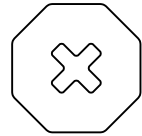


How does it work?

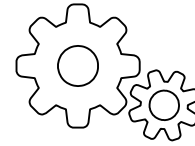
Industry



Problem



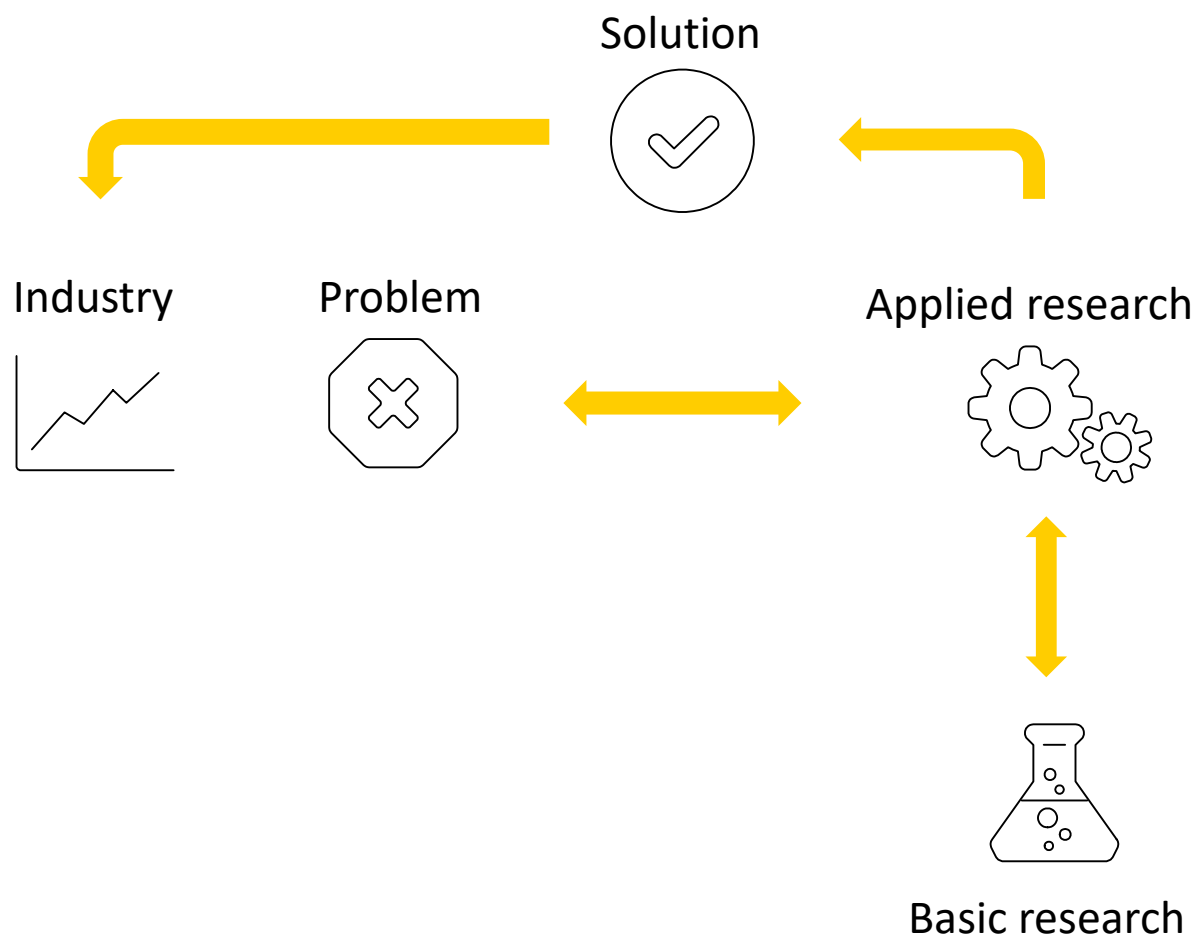
Applied research



Basic research

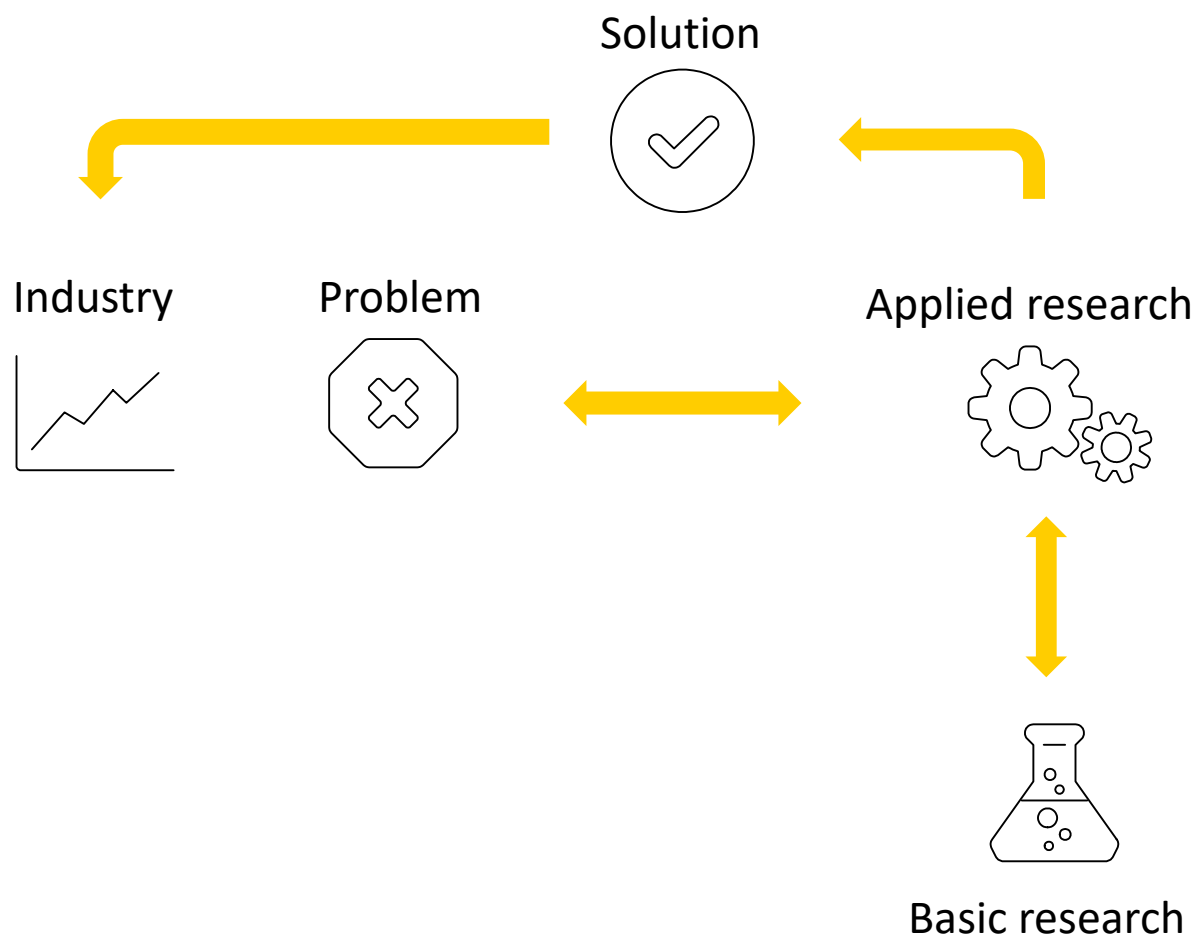


How does it work?





How does it work?

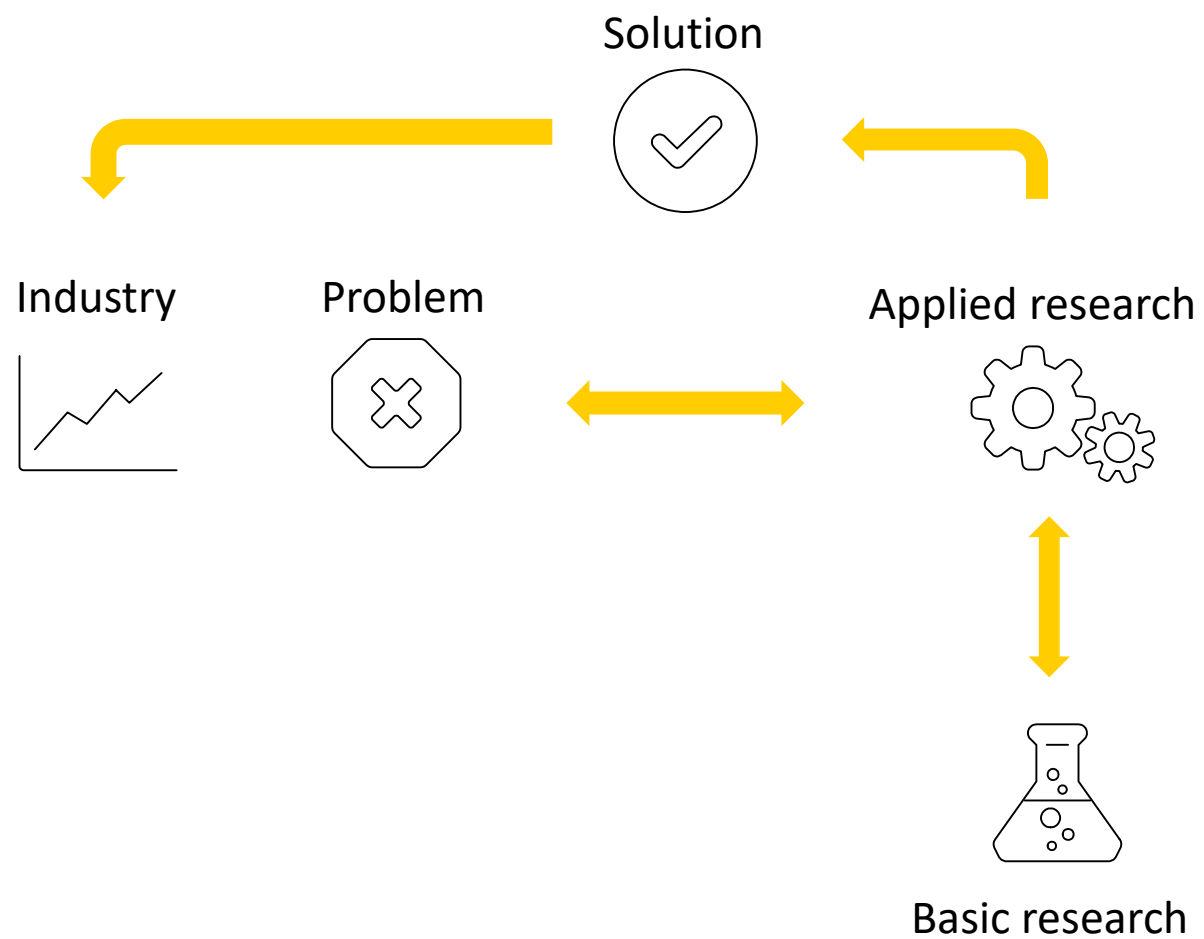


Economy





How does it work?



Economy

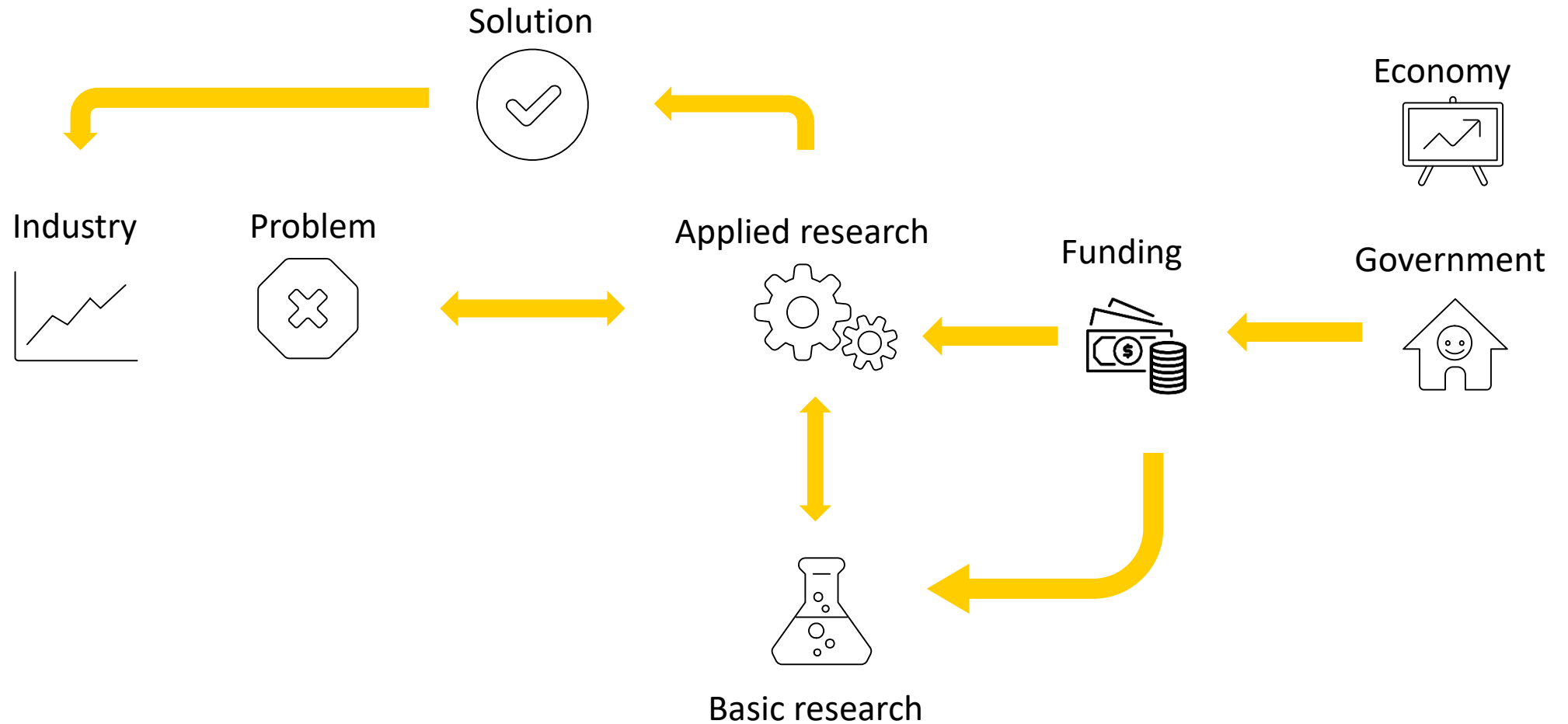


Government





How does it work?





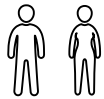
How does it work in Fraunhofer?



How does it work in Fraunhofer?



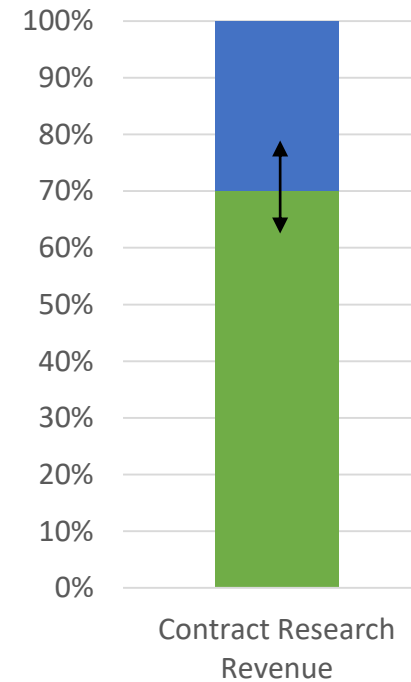
2.6 billion EUR annual research budget



26.600 staff members



72 research institutes



■ Government

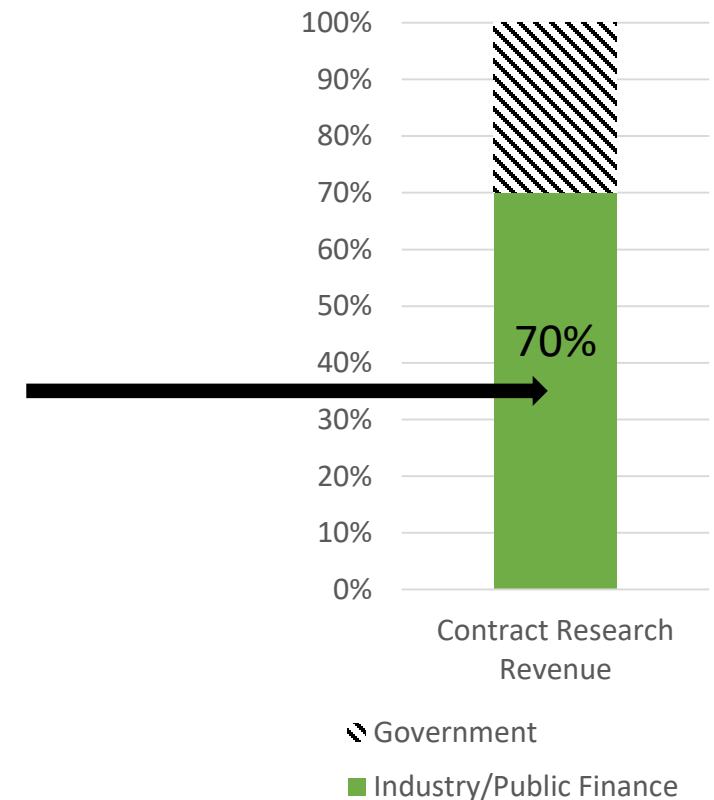
■ Industry/Public Finance



How does it work in Fraunhofer?

Cooperation Models

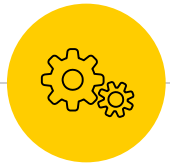
- One-off contracts: Solve a problem and launch an innovation within the company.
- Large-scale projects: complex problems with multiple partners – Fraunhofer institutes, companies, universities.
- Strategic Partnership: Pre-competitive research starts without any contracts often result in long-term partnerships.
- Innovation Clusters: Long-term collaboration between multiple research institutions and companies within the region.
- Spin-offs: Fraunhofer employees become independent.





Music Research in Fraunhofer?





Research Collaborations





Skoove by Learnfield

Hundreds of piano lessons

Learn your favourite songs and even compose your own. Our pioneering method features a growing list of over 300 songs and lessons.

- Chart Hits**
From John Legend, to The Beatles, to Coldplay, to Adele and more.
- Classical Pieces**
Renowned pieces from Beethoven, Debussy, and the composers that shaped the piano tradition.
- Improvisation**
Compose your own melodies and songs, and start jamming immediately - Skoove will show you how!
- Proper Technique**
Accelerate your progress with proper playing technique - you're in good hands with Skoove.



Technologies for polyphonic pitch detection



<https://www.skoove.com/en/>





Jamahook



Technologies for music similarity

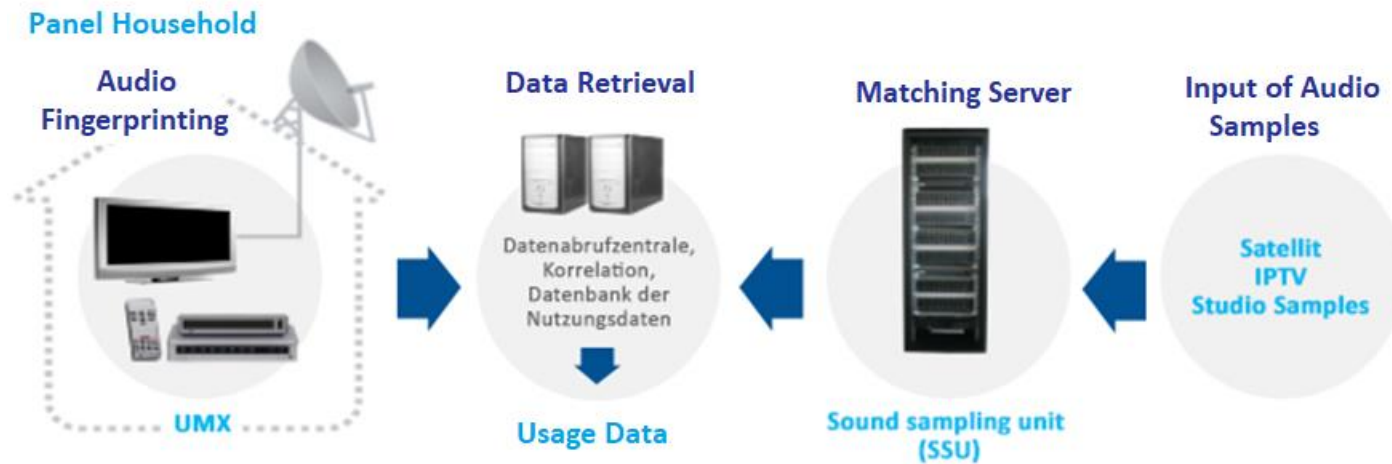


<https://www.jamahook.com/>





GfK – Telecontrol



Technologies for audio fingerprinting

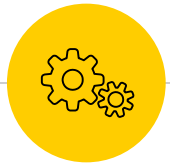




Other cooperation projects

- Broadcast industry
- Archives
- Manufacturing industry
- Research institutes
- Music production
- Content providers
-





The Songs2See Project





The Songs2See Project

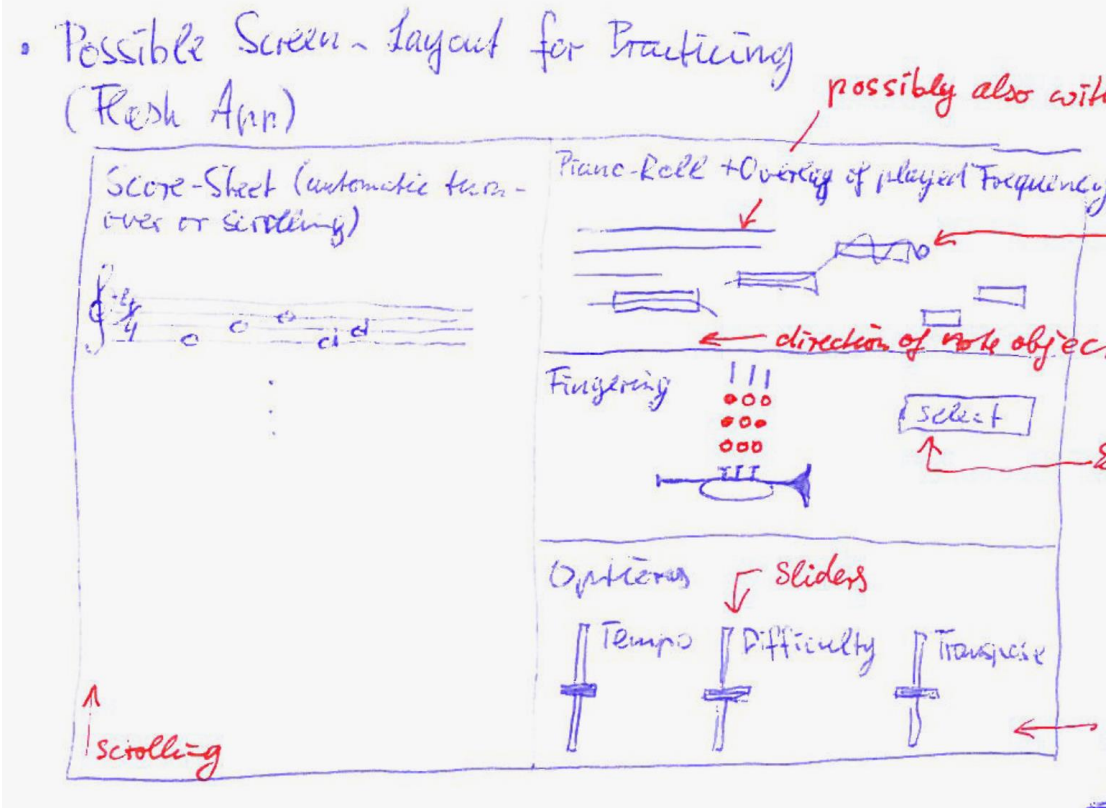
- **Idea:** Music visualization through an interactive application based on technologies for automatic music transcription.
- **Financing:** Freistaat Thüringen and European Regional Development Fund
- **Partners:**
 - Kids Interactive GmbH
 - Sweets for Brains GmbH
 - Grieg Music Education
 - Tampere University
 - Fraunhofer IDMT





The idea: Development phase

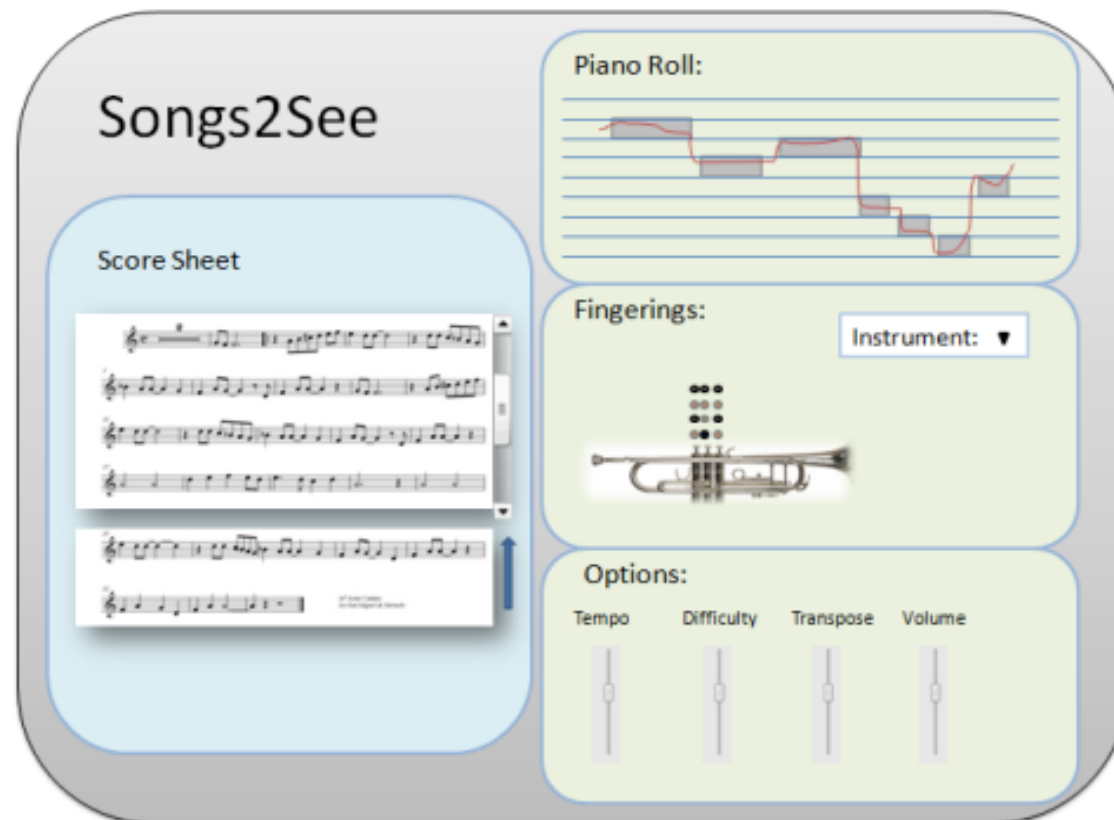
2010





The idea: Development phase

March 2010





The idea: Development phase

June 2010

@CMMR

Songs2See

Artist: James Cave
Title: Time
Points: 0 / 10000
0:1 / 0:18

Controls

Play Stop Pause

Options

Tempo Difficulty Transpose Volume



The idea: Development phase

March 2011

@Cebit, Didacta, Musikmesse

The screenshot displays the Songs2See software interface, which is used for analyzing and visualizing music. The interface includes several panels:

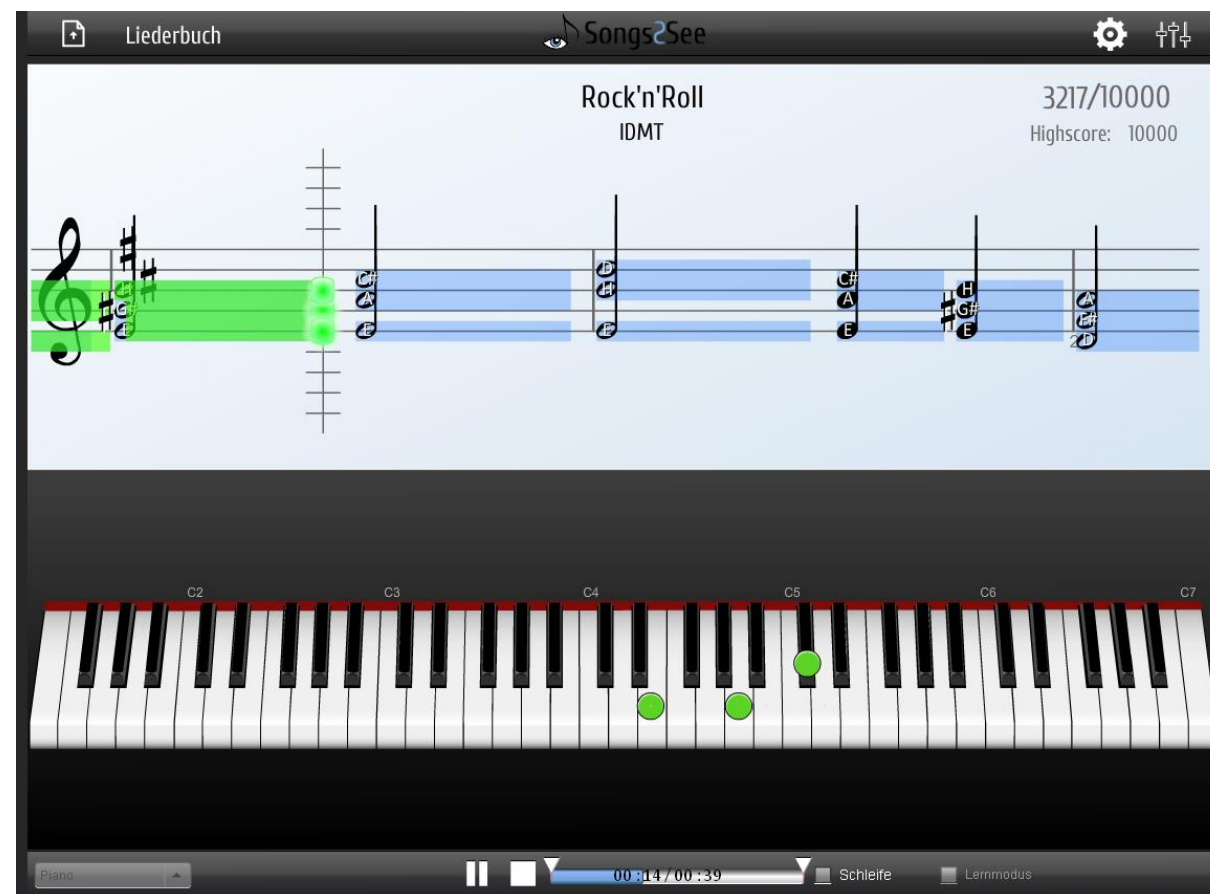
- Header:** Fraunhofer IDMT logo, Songs2See title, and a dropdown menu for the song "Scorpions - Wind of Chan...".
- Artist/Title/Points:** Artist: Scorpions, Title: Wind of Change, Points: 2241 / 10000.
- Controls:** Play, Stop, Pause buttons, and a checkbox for "Ignore octave".
- Tempo:** Normal (selected) and Slow radio buttons.
- Audio Mixer:** Sliders for Master, Background, and Instrument.
- Options:** A slider for Tolerance.
- Instrument:** A dropdown menu set to "Trumpet" and an image of a trumpet.
- Visualization:** A large area showing a piano roll with notes and a staff with musical notation. The notes are color-coded (green, red, black) and labeled with letters (F#, E, G, D, A, e, h, A, D, A, A7).



The idea: Development phase

March 2012

@Musikmesse, Ideenpark



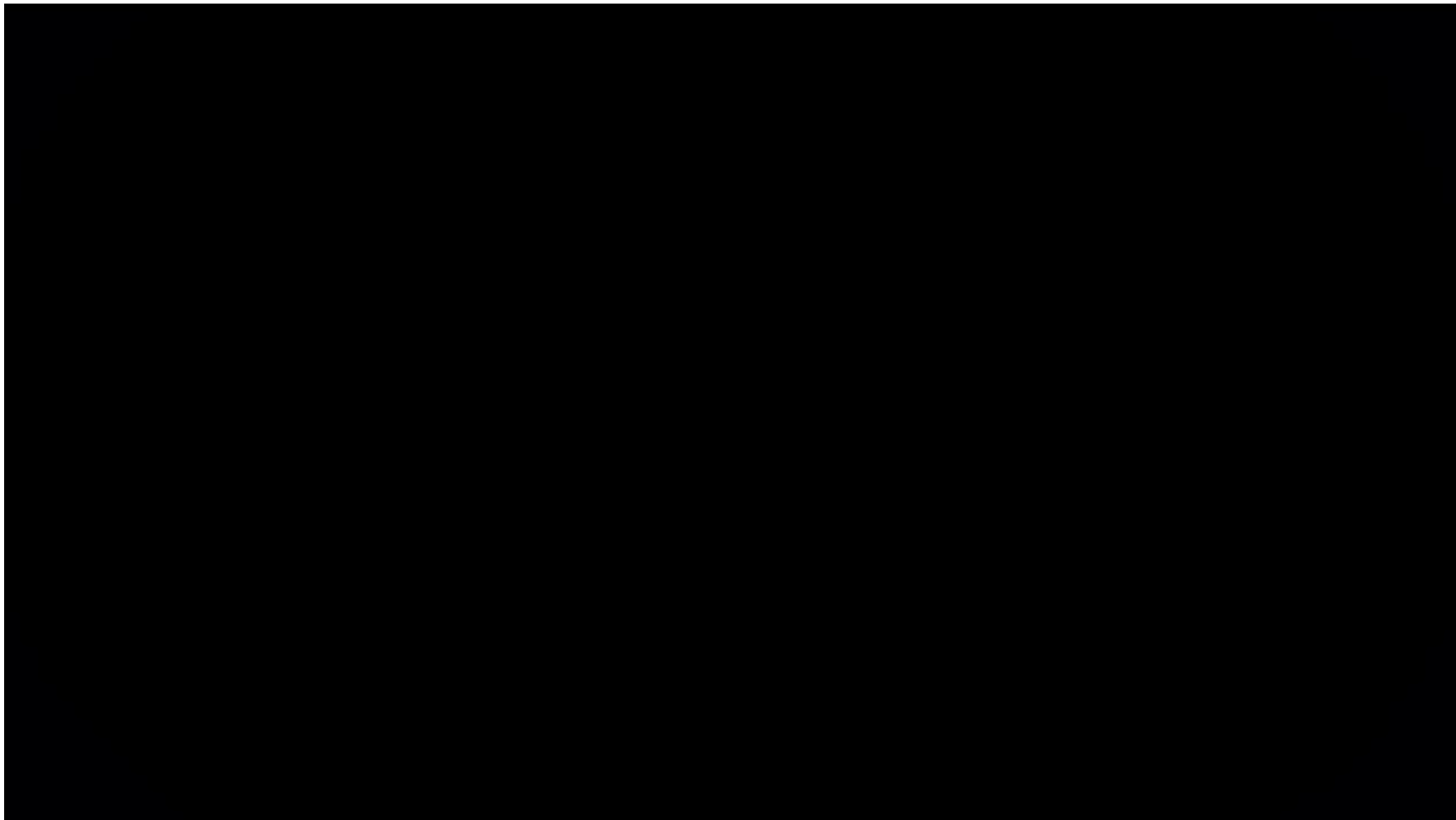


The idea: Development phase

June 2013

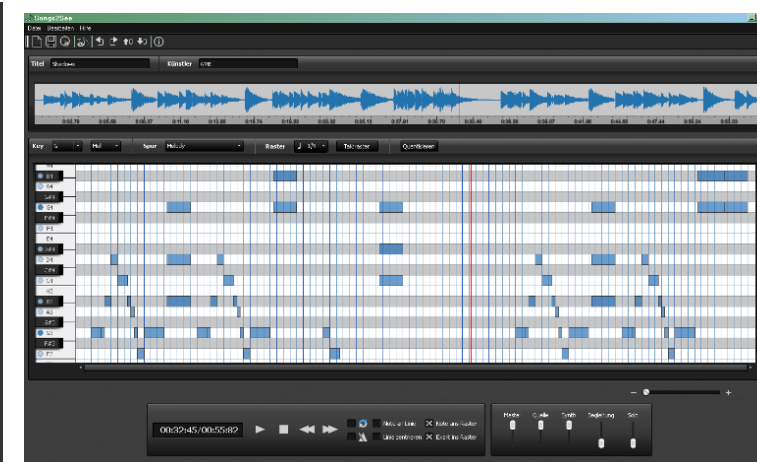
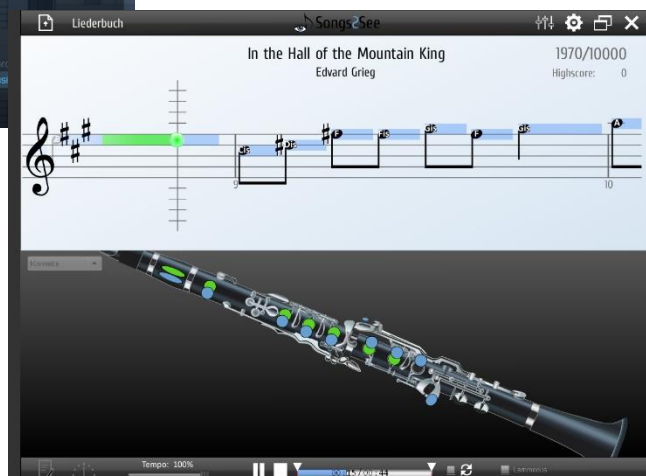
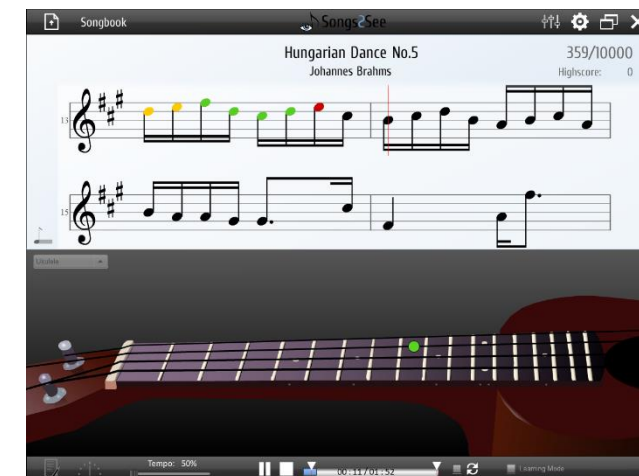
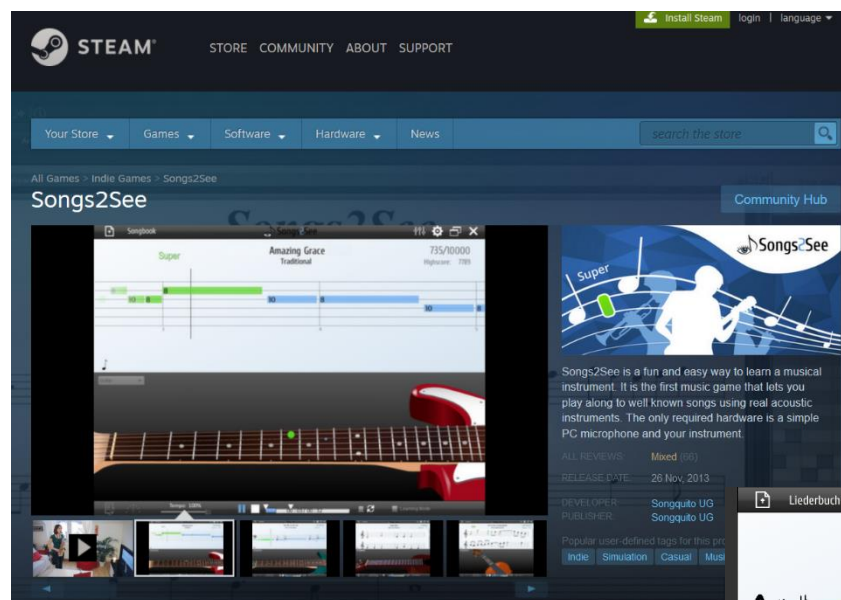


The screenshot displays the 'Songs2See' application window. The title bar includes 'Songbook', the application logo 'Songs2See', and standard window controls. The main content area shows the title 'Hungarian Dance No.5' by 'Johannes Brahms' with a progress indicator '359/10000' and a 'Highscore: 0'. Below this, two staves of musical notation are visible, with notes highlighted in yellow, green, and red. A vertical red line indicates the current playback position. At the bottom, a fretboard for a 'Ukulele' is shown with a green dot on the second fret of the fourth string. The bottom status bar includes a 'Tempo: 50%' setting, playback controls (play, stop, previous, next), a progress bar showing '00:11 / 01:52', and a 'Learning Mode' toggle.





The product:



Innovationspreis
der Gesellschaft
für Informatik



How does it work?

- One-off contracts: Solve a problem and launch an innovation within the company.
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Thanks!

Any questions?