\section{Related Work}

\label{sec:related\_work}

% Your work needs to be grounded and compared to earlier work and the state-of-the-art. Start the section with announcing the research gap and also end with the research gap. Consider using hypotheses.

Write about your related work here. Make clear to which key papers you will compare your eventual results. This can be done from the perspective of methods used, the task at hand and the addressed domain.

% The related work section is not a a background section. If you want to explain techniques, it is possible to have a background section after the Related Work section. Background should only be added when it has benefit for an informed audience. It is not common to use a background section.

table listing tools with mini-description

Overview of features that exist to see which to include in my own studies

\section{Related Work}

\label{sec:related\_work}

This section first introduces relevant information about the role music plays in people's lives and provides an explanation of self-reflection and self-representation for the scope of this research. Then, it outlines findings from previous approaches to the visualization of music collections, which provide a useful starting point for the approach of this research.

\subsection{Affective Computing}

\begin{itemize}

\item Meaningful HCI design must address 5 components: Connectedness - to self and world; Coherence - Making sense of one’s experiences; Resonance - Feeling that something is right; Purpose - Sense of core goals, aims, and directions; Significance - Enduring value and importance \cite{mekler\_framework\_2019, rajcic\_mirror\_2020}

\item In that framework, meaning as “moment-to-moment experience”; not on long scale but within everyday life

\item Meaning personal and subjective

\item Meaning is projected through those 5 aspects; can be understood by looking at those aspects

\item Connectedness of meaning -> each experience linked and adhered in relation to previous experiences; connections are established

\item Meaning relates to self thus also just as dynamic and changing throughout but also highly related to social and cultural backgrounds, thus people from similar background presumably experience similar things as meaningful

\item Purpose = goal from which motivation towards meaning derives; asking what?

\item Coherence = understanding of experiences through relation with previous events; by reflecting on the effect; asking why?

\item Resonance = impression; immediate experience without further reflection, feeling that something is right

\item Significance = understanding the value or importance of a made experience in relation to previous experiences

\item Reflection strongly related to meaning in all aspects but resonance

\end{itemize}

**\subsection{The Role of Music for Self-Reflection and Self-Expression}**

**\label{sec:importance\_music}**

Music plays a great impact on people's moods and emotional state \cite{khulusi\_survey\_2020}, and enables people to distract or entertain themselves and achieve self-awareness \cite{schafer\_psychological\_2013}.

\begin{itemize}

\item

\end{itemize}

Therefore, people make use of music as a tool for their mood regulation and handling of negative emotions such as stress \cite{fallon\_stress\_2020} or sadness and loneliness \cite{taruffi\_paradox\_2014} through self-reflective and self-expression practices.

According to \cite{hargreaves\_what\_2002}, the self is the central component of one's personality that is established through interactions and experiences and constantly and dynamically changes throughout live.

Meaning in HCI relates to the value, fulfilment, and goodness of a HCI object. Additionally, meaning can also define the information that aspects within HCI objects convey, such as the interaction features or instructions. \cite{mekler\_framework\_2019} . Within the scope of this research, the meaningfulness of music history visualization will be examined in the context of the value it conveys towards people’s self-reflection and self-expression practices. This is also motivated by the claim that meaning can only be derived by understanding and relating experiences through prior acquired knowledge.

Previous work has argued that self-reflection is a natural practice, that all individuals utilize for professional \cite{brownhill\_asking\_2022} and personal improvement, for example in terms of empathy and perspective taking \cite{gerace\_i\_2017}. \citeauthor{killion\_process\_1991} have developed the framework of self-reflection formats, whereby self-reflection can be practiced either in a \textit{structured} or \textit{unstructured} setting. Structured self-reflection consists of systematic thinking based on evaluative or exploratory questions, whereby unstructured reflection is practiced in a spontaneous thinking process that allows the unconstrained and natural flow of thoughts \cite{killion\_process\_1991}. Based on personal experiences cognitively associated with music, people can practice self-reflection \cite{rahmasari\_extended\_2022}, both by listening to music and by reviewing previously listened music histories. In HCI, being exposed to one's personally generated user data is comparable to seeing one's reflection in the mirror \cite{rettberg\_privacy\_2014}.

Music collections have further proven to contain such valuable personal information, that they can work as a means to represent an individual\cite{haro\_musical\_2010, rahmasari\_extended\_2022}. Self-expression has been identified as a crucial social practice. Through self-expression, people provide signals to each other based on which behavior and attitudes can be adjusted to enable appropriate interpersonal interactions\cite{goffman\_presentation\_1959}. In the context of personal music information, research has pointed out that people desire to express themselves through music \cite{rahmasari\_extended\_2022,haro\_musical\_2010,baur\_streams\_2010}.\todo{elaborate / explain in which ways}

\subsection{Music Visualization Approach}

\label{sec:previous\_visualization}

An early approach towards the visualization of music collections mentioned in numerous related works \cite{knees\_exploring\_2007, chen\_musicsim\_2009, meintanis\_visual\_2010, khulusi\_survey\_2020, bainbridge\_visual\_2004} has been developed by \citeauthor{pampalk\_islands\_2002}\cite{pampalk\_islands\_2002}. In this research, landscapes with hills and water served as an analogy for music collections containing music with similar and differing audio features. In \textit{Islands of Music}, collections of audio pieces were clustered, placed within a two-dimensional graph looking like a map. Music pieces within the visualized music collection were clustered together based on audio features, whereby pieces with more similar audio features within a collection accounted for an elevation within the region of an island that was visualized on the map. User interaction in \textit{Islands of Music} was limited to clickable areas through which short audio demonstrations of the music pieces could be played.

\citeauthor{knees\_exploring\_2007} have expanded this approach in a three-dimensional virtual reality setting to enhance the experience of exploring individual music collections\cite{knees\_exploring\_2007}. In this research, the music the closest to the user within the virtual reality was played and a music description map (MDM) consisting of web-scraped information such as genre, style, or instrument related to the music's artist was linked and displayed in the assigned area of each music piece. User evaluations concluded that exploring the music in this setting contributed to a better understanding of the similarities between music pieces, however, the addition of the music description map's textual data caused more confusion than it added value.

Similar to \citeauthor{pampalk\_islands\_2002}, \citeauthor{chen\_musicsim\_2009} researched how users could make sense of their music collections through graphs of their music\cite{chen\_musicsim\_2009}. The tool, \textit{MusicSim}, was implemented within a two-dimensional graphical user interface with a panel and a graph view. Within the graph view, music pieces were visualized through their cover images. The pane view provided descriptive metadata related to the visualized songs. The more similarities songs showed in audio features such as strongest beat, beat sum, and strength of strongest beat, the closer they were placed to each other within the screen. User evaluation proved that \textit{MusicSim} enhanced users' understanding of their music preferences and enabled users to compare and relate to personal music collections. Further, descriptive metadata in a textual and visual format was highly valued to recognize the music pieces within the graph. Moreover, users expressed the value of color-coding schemes for genres to group music collections based on similarities. However, it was emphasized that personalized genre tagging is highly subjective. Thus, genre tagging should not be used as an objective measurement for similarity.

\citeauthor{meintanis\_visual\_2010}'s study, which experimented with the design of a graphical user interface for music collection organization supports \citeauthor{chen\_musicsim\_2009}'s results\cite{meintanis\_visual\_2010,chen\_musicsim\_2009}. It further adds that explicit information about music is generally sufficient for people to understand and organize music collections but that implicit information such as moods and emotions should also be considered as they can add other valuable insights to individual music collections.

Another approach to visualizing music listening histories through a time graph linked to personal images and previous personal calendar entries has shown sufficient use for reminiscing. In this research, users pointed out the importance of information cues to simplify interaction with the visualization tool and mentioned that colors can help navigate through user data \cite{baur\_streams\_2010}. Further, the sharing of insights into music listening histories and the possibility to compare different collections to each other should be afforded.