



**HAL**  
open science

# Observing Musical Communities Dedicated to Improvisation and Duet Practice on TikTok Using Web Scraping

Marc Chemillier, Yohann Rabearivelo, Rémi Jaylet

► **To cite this version:**

Marc Chemillier, Yohann Rabearivelo, Rémi Jaylet. Observing Musical Communities Dedicated to Improvisation and Duet Practice on TikTok Using Web Scraping. *TikTok-Music-Cultures Perspectives on the Study of Musicking Practices On & Through TikTok*, Juan Bermúdez; Ylva Hintersteiner; Emma Schrott, May 2022, Vienne, Austria. hal-04454074

**HAL Id: hal-04454074**

**<https://hal.science/hal-04454074v1>**

Submitted on 3 Nov 2024

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## Observing Musical Communities Dedicated to Improvisation and Duet Practice on TikTok Using Web Scraping

Marc Chemillier (CAMS-EHESS), Yohann Rabearivelo (CAMS-EHESS), Rémi Jaylet (Télécom Paris), contact: [chemilli@ehess.fr](mailto:chemilli@ehess.fr)

### Abstract

In this paper we present a research dealing with musical improvisation practices on TikTok as part of a project devoted to the development of a music improvisation software. Finding musicians to experiment with led us to explore the musical collaborations encouraged by the platform. The duo function appears to be one of its most important feature from this point of view. Tracking relationships between musicians who duet with each other leads to the definition of musical communities that form on the network. These online communities pose new problems to the classic ethnographic approach to communities, and their study can benefit from new methods involving web scraping techniques. This article shows how to use these techniques in the context of TikTok and analyses some properties of the graphs that can be drawn from web scraping data collected within the musical communities that are formed thanks to the duet function. Certain properties of the graph, such as source and sink nodes, are highlighted and linked to musical roles such as soloist and accompanist.

Music plays a fundamental role on TikTok, particularly through dance challenges that promote songs to dizzying levels of listening<sup>1</sup>. The music industry has recognized the importance of this phenomenon for a few years, as evidenced by Microsoft's attempted acquisition in the summer of 2020<sup>2</sup>. Communities have formed around musical practices fostered by TikTok such as the duo function that allows one to complete a pre-existing video by recording a new video placed next to it.

In this article, we present research dealing with the interactions between musicians on TikTok in the field of improvisation, and the communities that form around these practices. We are interested in the roles played by musicians in collaborations fostered by the platform, such as the creation of duets. The first part of this article describes the basic features of TikTok and gives a brief overview of some academic work on the diffusion of cultural traits within communities, on the roles identified in musical interactions and on musical collaborations on TikTok using mainly the duet function. In the second part, we present our methodology for studying musical collaboration on TikTok using web scraping scripts we designed to explore the network of these collaborations. In the third part, we describe some properties of the graph representing this musical community. The properties of such graphs enable us to draw, from a musicological point of view, various different roles that TikTok musicians adopt in their online practice.

### TikTok and its duo function for music collaboration

TikTok, known as Douyin in China, is a video platform similar to YouTube, but mainly dedicated to short videos of less than sixty seconds. Like its musical.ly predecessor, it is a music-based video-sharing application, with social networking features such as the ability to post comments on videos or send private messages to other users, thus generating forms of social interaction. "Music-based" means that its content mainly involves users performing short skits, in particular dances and lip-

---

1 Johannes Ahlse, Felix Nilsson, Nina Sandström, "It's time to TikTok: Exploring Generation Z's motivations to participate in #Challenges," (Master Thesis, Jonköping International Business School, 2020), <http://www.diva-portal.org/smash/get/diva2:1434091/FULLTEXT01.pdf>

2 Cherie Hu, "Where TikTok fits in Microsoft's music strategy," first published in *Water & Music newsletter*, (Aug 4, 2020), available at <https://www.linkedin.com/pulse/where-tiktok-fits-microsofts-music-strategy-cherie-hu/>

syncs based on musical or other audio excerpts provided via the app. When a video goes viral on TikTok, the music track on which it's based is promoted to huge listening levels. The rapid propagation of videos made possible by TikTok's algorithm has attracted musicians to exchange sounds and ideas on the platform. Moreover, interaction between musicians has been encouraged by some of TikTok's features, such as the duet function, which we'll present in detail in this article.

Our motivation for studying musical interaction on TikTok stems from research we're carrying out on computer improvisation and the development of musical software capable of improvisation. Let us give a short example. The video (figure 1) shows an improvisation by the computer playing with the group of Malagasy guitarist Charles Kely Zana-Rotsy. The music generated by the software is controlled by a human who press various multicolor pads. Sequences played by the machine are based on a corpus including some transcriptions from the great jazz musician Ray Charles. Thus in this passage, some phrases by Ray Charles are integrated in the musical context of Malagasy music. The video published on TikTok points out this relationship by playing the Ray Charles original recording at the end of the computer improvisational excerpt. The issues of integrating a computer generated improvisation in the context of idiomatic music such as the one played by this group of world music artists is discussed in a paper by Marc Chemillier, who describes how the improvisation software works<sup>3</sup>.

How does this research relate to TikTok ? During the pandemic, we were not able to make fieldwork with musicians to experiment with our improvisation software, so we began to study music collaboration on TikTok, and to make videos on our TikTok account @digitaljazz. TikTok duo function promotes musical collaborations, and it is a very important feature of the platform. These collaborations define musical communities on TikTok in the sense that people interested in the same kind of music tends to collaborate. Our own interest lies in improvisation and our presence on TikTok was intended to meet (and try to collaborate with) other musicians sharing the same interest.



Figure 1 : Computer improvisation with Malagasy musicians

3 Marc Chemillier, "The smile of Velonjoro. Bi-musicality and the use of artificial intelligence in the analysis of Madagascar zither music," submitted to *Analytic Approach to African Music* (2022).

and the source of the machine learning process (excerpt from Ray Charles),  
<https://www.tiktok.com/@digitaljazz/video/6863074845467479301>

What is a duo on TikTok? Let us briefly explain how the duo function works. When you have a video on TikTok, its features include a duo button as shown in the picture on the left (figure 2). When you press this button, the video is reduced to the half part of the screen, and you can record your own duet part as a video which appears in the other half part of the screen. There are some pretty sharp issues that arise technically in the production of these duet videos. How to mix the sound in a professional way ? TikTok offers interesting tools for video editing, but there are no functionalities related to the mixing of the sound. Thus, TikTok musicians can choose between two methods to create duets from pre-existing videos on TikTok. The first one is the most direct. It consists in using the duet function available in the parameters of the reference video. The user can directly record his video next to the reference video that plays in the background. Thus it requires users of this function to be able to transmit sound to the phone using audio interfaces connected to it while listening to the reference video that plays in the background to be synchronous. When the video is finished the author of the reference video is automatically mentioned in the caption of the duet video, as well as the reference sound assigned to the author of the reference video. The second method used is to download the reference video and edit it with one's own video using specialized sound and video software, and then to upload the resulting video back on the platform. When using this method, the musician making the duet will have to manually mention the author of the reference video if he wants to, since it is not done automatically by the platform, and will have to fill in the original sound. This mention is placed in the caption of the video with the hashtag #duetwith or #duet followed by the user name of the person who made the initial video.

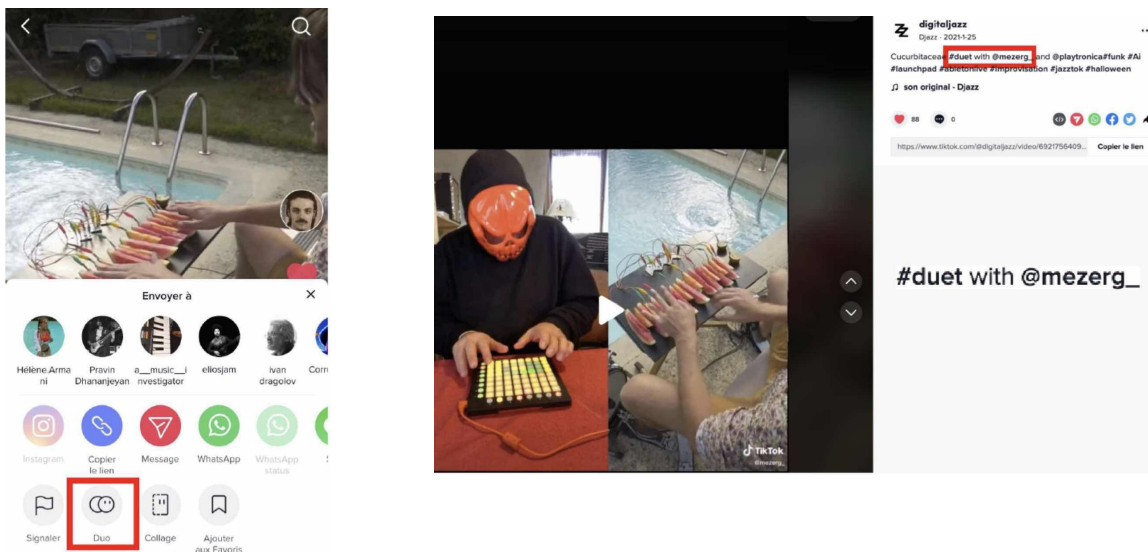


Figure 2 : Duo with Mezerg and its mention in the caption of the video : #duetwith @mezerg  
<https://www.tiktok.com/@digitaljazz/video/6921756409822481669>

What is a hashtag? Generally speaking in most social networks, a hashtag is a keyword preceded by the symbol #. For each hashtag, the application automatically adds a link that points to all pages containing the same hashtag. In our example, the picture on the right (figure 2) shows the resulting split screen of the duet and the corresponding caption with the hashtag #duet with @mezerg. In this case, we added a computer solo on a musical groove played by great pianist Mezerg (aka Marc Mezergue from Bordeaux, France) who used a very special interface designed by Playtronics that can connect a synthesizer to fruits such as watermelons in order to play sounds. Whether the #duet hashtag is added manually or whether it is put automatically by the platform, in both cases the author of the original video receives a notification that his video has been the subject of a duet. This

way, the user mentioned has the possibility to react or not. Hashtags are a powerful way of connecting music communities.

Around each TikTok musician, the collaborations encouraged by the platform make it possible to define a community of people sharing a common interest. In classical ethnomusicology, the notion of community generally refers to a determined geographical space such as a village or a group of villages, where people speak a common language and participate to common social activities including music. But we know since the arrival of jazz that the appearance of the recorded disc has led to the deterritorialization of this notion of community. This process of creation of new musical communities from the emergence of new practices has been well described about jazz by Jean Jamin and Patrick Williams among others:

“through borrowings and repeats, quotations, shared turns, the improvisations of one which become a theme for the other, jazz musicians can give the impression that they live on a common stock of formulas and that they take part in the same invention. Following the paths of this sharing and showing how all these individual creations relate to each other is an essential work: it is to do ethnology without leaving music as an object. At the end of such an examination, the idea of community reappears; but a community based on a way of conceiving and practicing music – a way of conceiving and practicing society.”<sup>4</sup>

When transferred to digital platforms and social networks, the notion of geographical space applied to the practice of music becomes what Juan Bermúdez calls a “musical geography through praxis.”<sup>5</sup> Actually, video platforms like TikTok push this process even further by creating new musical communities around practices introduced by the platform and shared very quickly by an increasing number of people. The speed at which ideas and cultural traits spread over this type of network is new data that upsets the traditional notion of cultural context. Several theoretical approaches have attempted to identify this phenomenon, whether it is the notion of the meme introduced by Richard Dawkins<sup>6</sup> or that of the epidemiology of representations described by Dan Sperber<sup>7</sup>, and these theories find a fascinating field of application on a platform like TikTok<sup>8</sup>.

From a musicological point of view, interaction between musicians on TikTok using the duo function consists in adding musical parts to a pre-existing musical setting. This is reminiscent of the ancient practice of the 16th-century “parody mass”, which involved using several voices from a pre-existing polyphony, such as a fragment of a motet or secular chanson, as the melodic material for a new composition<sup>9</sup>. Roles in musical interaction can be analysed through general musicological categories such as soloist / accompanist. For instance, Ekkehard Jost describes the evolution towards free jazz as the elimination of the rhythm section's accompaniment function in favor of interaction between all the musicians in the group<sup>10</sup>. More specific analysis of musical roles can be found in the field of performance studies. Following Erwin Goffman<sup>11</sup>, Philipp Auslander highlights the micro-elements that indicate a musician is going to improvise rather than play a fixed

---

4 Jean Jamin, Patrick Williams, “Présentation. Jazzanthropologie,” *L'Homme* 158-159 (avril-septembre 2001): 7-28, <https://doi.org/10.4000/lhomme.135> (our translation).

5 Juan Bermúdez, “It's All About 'Being There': Rethinking Presence and Co-Presence in the Ethnographic Field during and after the Covid-19 Pandemic.” *Journal of World Popular Music* 10(1) (2023): 19–35.

6 Richard Dawkins, *The Selfish Gene* (New York: Oxford University Press, 1976).

7 Dan Sperber, “An objection to the memetic approach to culture,” in Robert Aunger, *Darwinizing Culture: The Status of Memetics as a Science* (Oxford University Press, 2000), 163-173.

8 Lou-Anne Donguy, “TikTok, l'influence de l'application et des réseaux sociaux sur l'industrie de la musique” (M1 Master thesis, Sorbonne University, Paris, 2022).

9 Lewis Lockwood, “Mass. The cyclic mass in the later 15th century,” *The New Grove Dictionary of Music and Musicians* (London: Macmillan Publishers, 1980).

10 Ekkehard Jost, *Free Jazz* (Da Capo Press, 1994).

11 Erving Goffman, *Frame Analysis: An Essay on the Organization of Experience* (Boston: Northeastern University Press, 1974).



arrangement (position on stage, gestures to concentrate and encourage inspiration)<sup>12</sup>.

In the context of the aforementioned studies on music communities and interaction, what is our research question? As we have seen, TikTok has attracted many musicians to the platform and offered them powerful interaction features such as the duet function. Communities of musicians have thus formed on the network, but they don't necessarily replicate existing communities of musicians who used to collaborate. What kind of new musical communities has TikTok created? How do musicians interact within these communities? As we have seen, the duo function stimulates interaction. We can observe roles in these interactions between musicians, and it's a good research question to know whether they are related to the roles involved in real-life musical interaction such as soloist / accompanist and various featurings, as studied in a musicological approach. Since we are interested in improvisation, as mentioned above, we would like to engage with and contribute to the understanding of improvisational practices and cultures among musicians on TikTok.

Substantial academic work already exists on communities and interaction on TikTok. Daniel Klug, for example, is interested in analyzing the content of videos such as dance challenge videos where visual elements, gestures, facial expressions and paratextual characteristics are studied<sup>13</sup>. The economic aspects related to the attention economy are studied by Crystal Abidin<sup>14</sup> while Brook E. Duffy addresses the issue of algorithmic precarity<sup>15</sup>. The spreading of elements among communities on TikTok has been studied by Ariadna Matamoros Fernandez, Aleesha Rodriguez and Patrik Wikström who problematize sound as a key element in racializing memetic practices on TikTok<sup>16</sup>, and by Fan Yang, Yanan Qiao, Shan Wang, Cheng Huang and Xiao Wang, who use blockchain and multi-agent system for meme discovery and prediction in social network<sup>17</sup>. The group TikTok Cultures Research Network offers good insights on these flourishing research work<sup>18</sup>, but those specifically devoted to musical interaction and the duo function are still rare, with the exception of articles by D. Bondy Valdovinos Kaye<sup>19</sup>, Catherine O'Tool<sup>20</sup>, and Parth Sinha and Pavel Telica<sup>21</sup>. We give an overview of the first and last works.

Kaye surveyed a community of TikTok musicians who identify themselves under the hashtag #jazztok. Using the duo function, they were able to add successive musical parts to a given video in collaborative jams sometimes gathering up to 7 or 8 musicians. In such cases, the author speaks of

- 
- 12 Philipp Auslander, "Jazz Improvisation as a Social Arrangement," In *Taking It to the Bridge: Music As Performance*. Ed. Nicholas Cook and Richard Pettengill (Ann Arbor: University of Michigan Press, 2013).
  - 13 Daniel Klug, "Performance and Production Practices in Dance Challenge Videos on TikTok," Paper to be presented at NCA 106th Annual Convention: Communication at the Crossroads, (Indianapolis, November 19-22, 2020), <https://arxiv.org/abs/2008.13040>
  - 14 Crystal Abidin, "Mapping Internet Celebrity on TikTok: Exploring Attention Economies and Visibility Labours," *Cultural Science Journal* 12, no. 1 (2021): 77-103, <http://doi.org/10.5334/csci.140>
  - 15 Brook E. Duffy, "Algorithmic precarity in cultural work," *Communication and the Public* 5 no. 3-4 (2020): 103–107.
  - 16 Ariadna Matamoros Fernandez, Aleesha Rodriguez and Patrik Wikström, "Humor That Harms? Examining Racist Audio-Visual Memetic Media on TikTok During Covid-19," *Media and Communication*, 10(2), (2022): 180–191, <https://eprints.qut.edu.au/229982>
  - 17 Fan Yang, Yanan Qiao, Shan Wang, Cheng Huang, Xiao Wang, "Blockchain and multi-agent system for meme discovery and prediction in social network," *Knowledge-Based Systems* 229 (2021).
  - 18 TikTok Cultures Research Network: <https://tiktokcultures.com/publications/>
  - 19 D. Bondy Valdovinos Kaye, "Please Duet This: Collaborative Music Making in Lockdown on TikTok," *Networking Knowledge: Journal of the MeCCSA Postgraduate Network* 15, no. 1 (YouTube and Online Video in Lockdown Special Issue, 2022): 59–77, <https://ojs.meccsa.org.uk/index.php/netknow/article/view/654/409>. See also D. Bondy Valdovinos Kaye, Jing Zeng, and Patrik Wikström, *TikTok: Creativity and Culture in Short Video* (Cambridge, UK: Polity, 2022).
  - 20 Katherine O'Toole, "Collaborative Creativity in TikTok Music Duets", *CHI'23, ACM CHI Conference on Human Factors in Computing Systems*, avril, 23-28, Hamburg, Germany (2023), <https://dl.acm.org/doi/pdf/10.1145/3544548.3581380>
  - 21 Parth Sinha, Pavel Telica, "Examining the Power of the Tik Tok's Duet Feature," *Intelligent Music Agency* (2022), <https://www.intelligentmusic.org/post/examining-the-power-of-the-tik-tok-s-duet-feature>

“duetchains,” a notion that we shall recall later in the present paper. These are duos of duos, creating complex jams in the manner of an exquisite corpse. The author's investigation is based on the testimonies of these #jazztok musicians with whom he was able to speak in interviews (18 recorded interviews made with Zoom and then transcribed using an automatic device). Indeed, we learn that it is through the online musical meeting including the use of the duo function, that users were able to develop “duet jams,” a notion inspired by Sawyer and DeZutter's theory of distributed creativity<sup>22</sup>. So they could locate and connect with each other, and build a relationship continuing with the live function of TikTok allowing them to discuss in real time, or while meeting on other platforms like Discord.

Sinha and Telica have studied how duets on TikTok are widely used by musicians to expand their audience in the hope of increasing their listenership on streaming platforms. They examine three cases including the case of Stacey Ryan, a Canadian member of the jazztok community. Her audience as well as the number of listens she got would have increased on the Spotify and Instagram platforms, a few hours after the publication of her #openversechallenge video<sup>23</sup> where she proposed to sing with her via the duet function. She finally released a studio version of her song “Don't Text Me When You're Drunk” (Island Records, 2022) with Zai1k, a musical artist and TikTok user who had collaborated with her “open verse” challenge<sup>24</sup>, thus extending into the real music industry a collaboration that first appeared in the virtual world of TikTok<sup>25</sup>. The article ends by suggesting that “the duet feature should be considered an extremely powerful tool that has the potential to generate virality for creators of all sizes and genres.”

### Scraping the musical communities on TikTok

To describe the musical communities, and to analyze the way new cultural traits spread via the network, we use the usual methods of video analysis and ethnographic surveys conducted with TikTok musicians. What is a video analysis? This involves studying video capture techniques, sets, costumes and staging, as well as the sound track and paratextual elements such as captions and on-screen text. In terms of video capture technique, for example, improvisation will be more credible if it's a sequence shot than a sophisticated film editing. What is ethnography? This involves observing musical practices on TikTok and contacting musicians to conduct interviews with them, and listening comments of various pieces of music. Observation can become participatory when the ethnographer himself becomes involved in the practices. This is what we do by publishing music videos ourselves on two TikTok accounts @digitaljazz and @digital\_jazz showing experiments with an improvisation software, as we have described earlier.

In addition to these classic approaches, we also use web scraping techniques to highlight the relationships between musicians and the musical communities that are formed through their practices, and more specifically through TikTok duo function. When a musician duets with another, he usually mentions it in the caption of the video as we have said before: #duetwith @someone. We are interested in this kind of information, and thus we study the general relation “X mentions Y in the caption of a video.” Depending on the hashtags, it might indicate various musical relations (#duet, #cover, #reply to a comment, etc.). By following such relations using a web scraping algorithm, one can draw the community of people who share some common musical interest. Similar studies using web scraping techniques have already been conducted successfully on various subjects such as amateur online film critics<sup>26</sup> or the analysis and the visualization of political

---

22 R. Keith Sawyer, Stacy DeZutter, “Distributed creativity: How collective creations emerge from collaboration,” *Psychology of Aesthetics, Creativity, and the Arts* 3, no. 2 (2009):81-92, <https://doi.org/10.1037/a0013282>

23 Stacey Ryan's #openversechallenge: <https://www.tiktok.com/@staceyryanmusic/video/7047292169790541062>

24 Zai1k response to the #openversechallenge : [https://www.tiktok.com/@zai1k\\_/video/7049149340962573615](https://www.tiktok.com/@zai1k_/video/7049149340962573615)

25 Stacey Ryan asking Zai1k to collaborate: <https://www.tiktok.com/@staceyryanmusic/video/7050354631788023046>

26 Valérie Beaudouin, Dominique Pasquier, “Forms of contribution and contributors' profiles: An automated textual

opinions from Twitter data<sup>27</sup>.

We use the unofficial TikTok API designed by David Teather<sup>28</sup>. Based on this API, we designed several scripts written in the Python language based on the Breadth-First Search algorithm<sup>29</sup> in order to collect the relationship “*X* mentions *Y* in the caption of a video.” The program follows these links through the TikTok network and collects the corresponding data (URL of the videos, user names of the *Y*s, etc.). For a given TikTok user *X*, it proceeds in a recursive way by computing

- at first step all the *Y*s mentioned by *X*,
- then all the *Z*s mentioned by each *Y* previously found,
- then all the *W*s mentioned by each *Z* previously found, and so on.

The resulting set of people gathering *X* and the *Y*s, the *Z*s, the *W*s... build some kind of musical community.

Here is an example of the execution of the script with initial parameters given at the beginning. In this case, the search is done by following the links from only one user (@digitaljazz), by iterating the search with only 10 of the people mentioned by each user (n\_user=10) and by visiting only 30 videos for each user (n\_vid=30). These limitations are necessary to avoid searching for too long. The first iteration searches for all people who have been mentioned by @digitaljazz (limited to 10 people). The other iterations will repeat the same search from people found in the previous step and so on. For two iterations, we may have 100 people found, for three 1000, etc. It is obvious that this cannot be done manually and that automated web scraping techniques are needed.

```
% python3 tiktok_music.py
Press 'enter' to validate the default values
Number of users to initialize with (start = 1):
Usernames to initialize the algorithm:
digitaljazz
Number of users to end the algorithm (n_user = 10):
Max number of visited videos (n_vid = 30):
Max number of followers (max_followers = 50000):
Keep only duo relationships ? (only_duo=False):

iteration # 1 : digitaljazz
etc.
```

The result is written in a CSV file. In the first column, you have all the user names that have been found. In the corresponding rows, you have the biography of their TikTok account, then in a further column the list of user names that have been mentioned in the captions of their videos. The script tries to selected among them the ones that may correspond to musicians (this is done by taking into account the hashtags chosen by these users as we describe below) and we also give the URL of the videos where the mention can be found for manual verification. Thus, the script also contains a certain number of keywords that allows it to select or not a content to analyze. In our case, if a video contains at least three of these keywords related to music (for example: #synth, #groove, #jazz) it will be selected as a music video and the script will continue working.

One of the biggest issues of the scrapping part is due to the many changes in the privacy policy of TikTok. Indeed, the numerous modifications of the application makes the maintenance of the

---

analysis of amateur on line film critics.” *New Media Soc.* 19, no. 11 (2017): 1810-1828.

27 Nicolas Gaumont, Maziyar Panahi, David Chavalarias, “Reconstruction of the socio-semantic dynamics of political activist Twitter networks—Method and application to the 2017 French presidential election,” *PLOS ONE* 13, no. 9, (2018), <https://doi.org/10.1371/journal.pone.0201879>

28 David Teather, Unofficial TikTok API in Python (2022), <https://github.com/davidteather/TikTok-API>

29 The Breadth-First Search (BFS) algorithm begins with a given start node of a graph, and explores all nodes at the present depth prior to moving on to the nodes at the next depth level.



algorithm quite complicated. The access to some of the parameters can be suddenly removed because the algorithm depends on an unofficial and open-source API that is reliant on the updates made by the different persons involved in the project to try to counter the various modifications of TikTok. Moreover, even when everything is working, the interface is able to quickly detect recurrent calls from the same user. It appears therefore necessary to regularly change the connection token as well as to carry out a proxy rotation to make sure not to be blocked by the platform. Furthermore, it is not possible to have access throughout the API to certain of the features which might be private. This is why we only focused on the aforementioned public links (a user mentions with '@' another user on a particular video). This type of link is actually the most significant as it shows a real collaboration between different users. From an ethical point of view, the use of these strictly public data is also a way of guaranteeing that we don't violate the rules of privacy policy.

### Properties of the music collaboration graph

We visualized the relationship between musicians in the form of a graph using the Force Atlas 2 algorithm as implemented in the Gephi software. We can thus observe some specific properties as for instance the dense points (very active musicians on TikTok mentioning or mentioned by many other people), the sparse areas (non-active musicians), the possible separation of the graph into connected components (separate musical communities that don't interact with each other), the sub-graphs corresponding to specialized mentions (duets, covers, etc.). We are also interested in the motivations that push musicians to invest in these new practices.

The resulting graph is directed so that we use arrows in the display of the collaborations between musicians by distinguishing “X mentions Y” from “Y mentions X.” When it applies to duos, the relationship involves two distinct musical roles (soloing, accompaniment) corresponding respectively to source and sink nodes in the graph. A node is considered a *source* if there is no arrow coming from another node to this one. It mainly corresponds to solo instruments like synthesizer, sax, voice, etc. who can improvise on a given video. Likewise, a node is considered a *sink* if there is no arrow going from this node to another one. It is often associated with beatmakers who propose grooves that solo instruments can improvise with. In the graph displayed below (figure 3), there are two source nodes and one sink node that are surrounded by a rectangle.

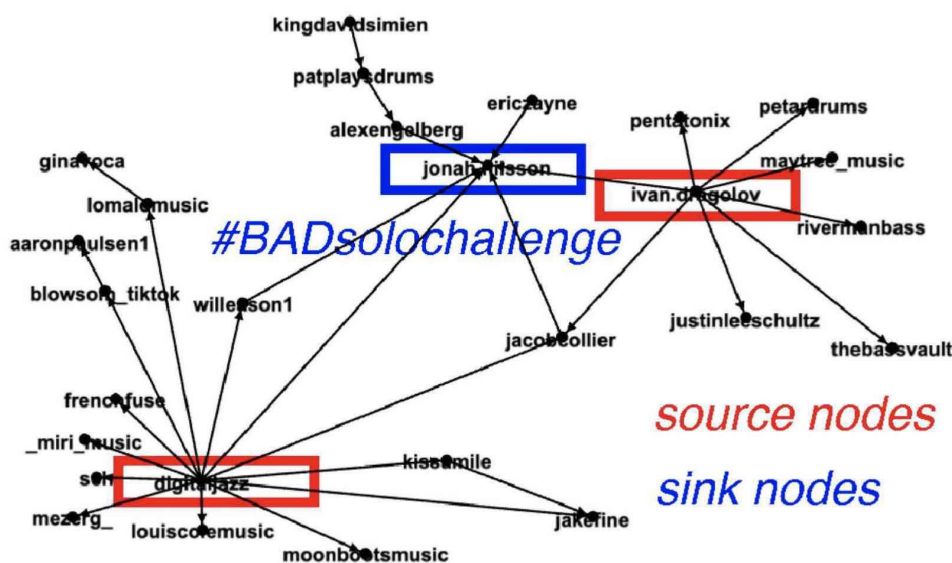


Figure 3: A music collaboration graph with source and sink nodes

The fact that a user is a source node means that every arrows connected to him are coming out of

this node. This is linked to a particular trend on TikTok known as the “challenge”: a user posts a video inviting other users to make videos related to it. The dance challenge studied by Daniel Krug mentioned above is a good example: one person dances to a piece of music and invites others to imitate his or her choreography. Some people offer a lot of challenges (they correspond to sink nodes in the graph), while others respond to many of them (source nodes). In music, a challenge usually takes the form of an invitation to perform a duet with a video that is posted online. When someone appears as a source node, ~~From a musical point of view,~~ it means that he makes duos with other people but no one makes duos with him. From a musicological point of view, it generally corresponds to soloist musicians. In the current graph (figure 3), the two source nodes correspond to solos generated by computer improvisation softwares : one is the computer program we are working on as described above @digitaljazz, and the other one is an expert musician from Bulgaria who works on a similar program @ivan.dragolov and that we have met through TikTok. We'll come back to the opposition between soloist and accompanist later.

In the graph (figure 3), there is also a sink node @jonah.nilsson with every arrows connected to this node being oriented towards the node. In this case, it corresponds to the famous keyboard player Jonah Nilsson born in 1987, from the group Dirty Loops. He published on July 1, 2021, a video with a nice groove associated with a challenge called #badsolochallenge<sup>30</sup>. Many musicians were stimulated by this challenge and made a duo with him including @ivan.dragolov. His challenge was related to an arrangement he made of Michael Jackson's tune “Bad,” that he published in his album *Now Or Never* (Jammcard Records, 2021). Interestingly, this track features three great keyboardists from very different generations and backgrounds: Canadian Nicolas Dupuis, born in the mid-1990s (@anomaliebeats, 60.5K followers), Justin-Lee Schultz, a young prodigy born in 2007 in South Africa and living in the USA (@justinleeschultz, 85.2K followers), and Jordan Rudess, aka Jordan Charles Rudes, a progressive metal keyboardist born in 1956 (absent on TikTok, but his hashtag #jordanrudess counts 4.8M views). They didn't respond to the #badsolochallenge, but we can guess that they never met in the studio to record this version of “Bad,” and that their collaboration is emblematic of the deterritorialization of musical practices and the blurring of boundaries between musical genres and generations of musicians encouraged by social networks.

These roles soloist / accompaniment should probably be studied in relation to *popularity*. One can presume that a TikTok user who wants to increase his popularity will tend to make duos with other users having a bigger number of followers. This might be the case in general, but it is not an absolute rule. As a counterexample, @haywyremusic (7615 followers) proposed a challenge in one of his videos with the message “ Trade solos with me on my new track !”. Then @oblvyn (70.3K followers) who is a quite skilled female synth player responded to the challenge by making a duo with him (figure 4). To analyse such an example, more contextual informations are needed. Both @haywyremusic, aka Martin Sebastian Vogt, and @oblvyn, aka Catherine Bliemal, are affiliated with the Canadian electronic dance music label Monstercat, but @haywyremusic, born in 1992, debuted on the label in 2013, while @oblvyn, who is younger, debuted in 2021, and she has already completed several online collaborations with @haywyremusic on various video platforms. Obviously, all these parameters need to be taken into account.

---

30 Jonah Nilsson's #badsolochallenge: <https://www.tiktok.com/@jonah.nilsson/video/6980006168919805190>

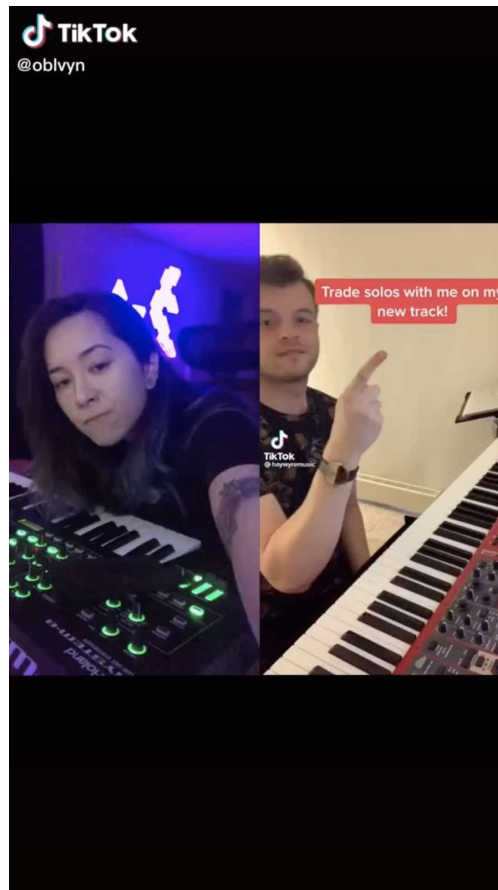


Figure 4 : A duet by @oblvyn (70.3K followers) on a challenge by @haywyremusic (7615 followers), <https://www.tiktok.com/@oblvyn/video/6950542822944574726>

There exist *duet chains*, in the sense introduced by Kaye, when someone duets a video that is already a duo as we have seen earlier by recalling the principle of exquisite corpse. This can be written in this way :

$$A \rightarrow (B \rightarrow (C \rightarrow D))$$

It means that *C* made a duet video with *D*, then *B* added a part to the resulting video, and then *A* also added a part to this trio. In the graph, one can find an example of duet chain going from @kingdavidsimien to @jonah.nilsson (figure 5).

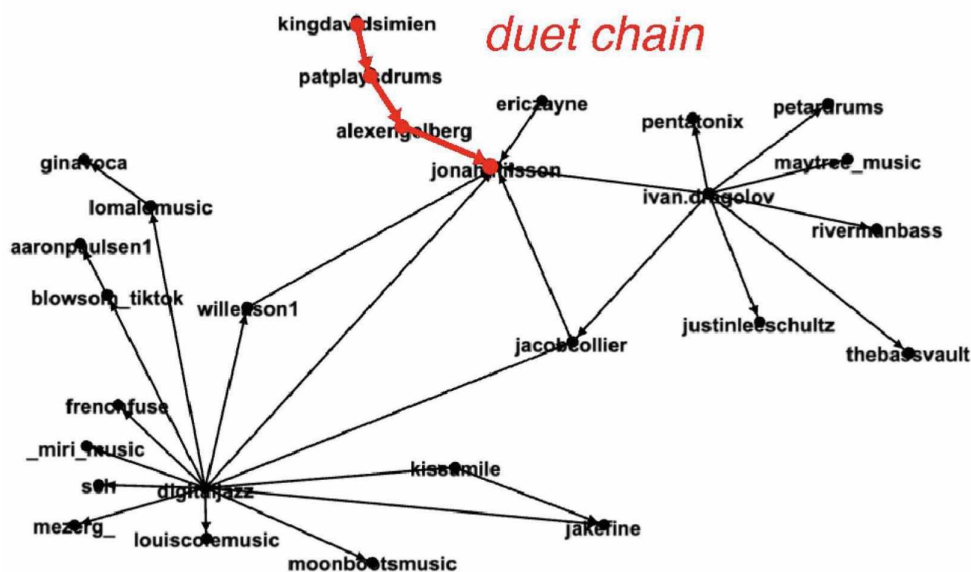


Figure 5 : An example of duet chain that ends with @jonah.nilsson (#badsolochallenge)

It is based on the same #badsolochallenge mentioned above with musicians accumulating their parts to the initial video by @jonah.nilsson beginning with @alexengelberg on solo keyboard, then @patplaysdrums on drums, and then @kingdavidsimien on bass. The first part added was a direct response to Jonah Nilsson's challenge for a solo (#badsolochallenge). But the other two are spontaneous additions not requested by the original video. The second is a drum part, although there is already one in the original groove. The third is a bass part in unison with Jonah Nilsson's bass line. This situation shows that roles in musical collaboration on TikTok are not necessarily predefined by the person issuing the challenge. As we have said before, the two basic roles are soloist (when someone adds a solo part to a pre-existing groove) and accompanist (when, for instance, someone harmonizes an a cappella voice or a solo instrument). But between these two clearly opposed categories, there are probably many intermediate situations, mainly in the case of duet chains where musicians freely add parts to pre-existing ones.

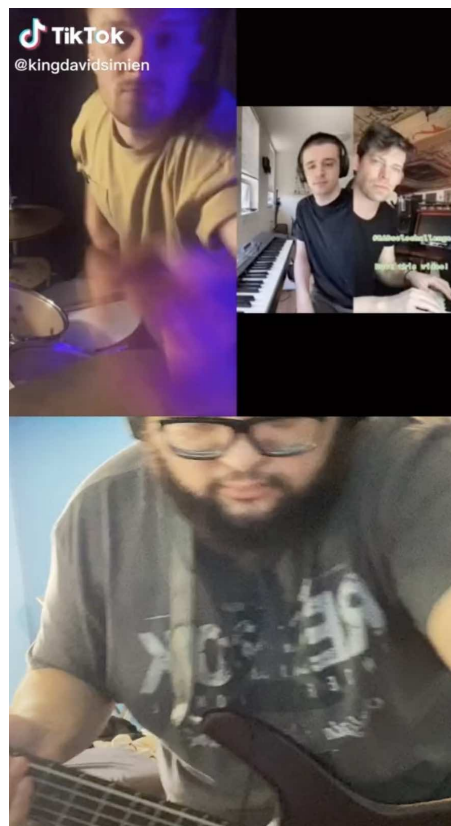


Figure 6 : Video of the previous duet chain (#badsolochallenge by @jonah.nilsson)  
<https://www.tiktok.com/@kingdavidsimien/video/6995135715264793862>

But graph chains may not be duet chains. They may correspond rather to *role reversal*. When you have the following chain  $A \rightarrow B \rightarrow C$  in the graph, it generally means that  $B$  plays two different roles and that the video of his duet with  $A$  is not the same as the video of his duet with  $C$ . More precisely, one has :

$A \rightarrow B$  as accompaniment

$B$  as soloing  $\rightarrow C$ .

In the graph displayed as an example above, we can find a path  $A$  to  $B$  to  $C$  of this kind involving two different videos where  $B$  is represented by @jacobcollier who plays two different roles (figure 7).

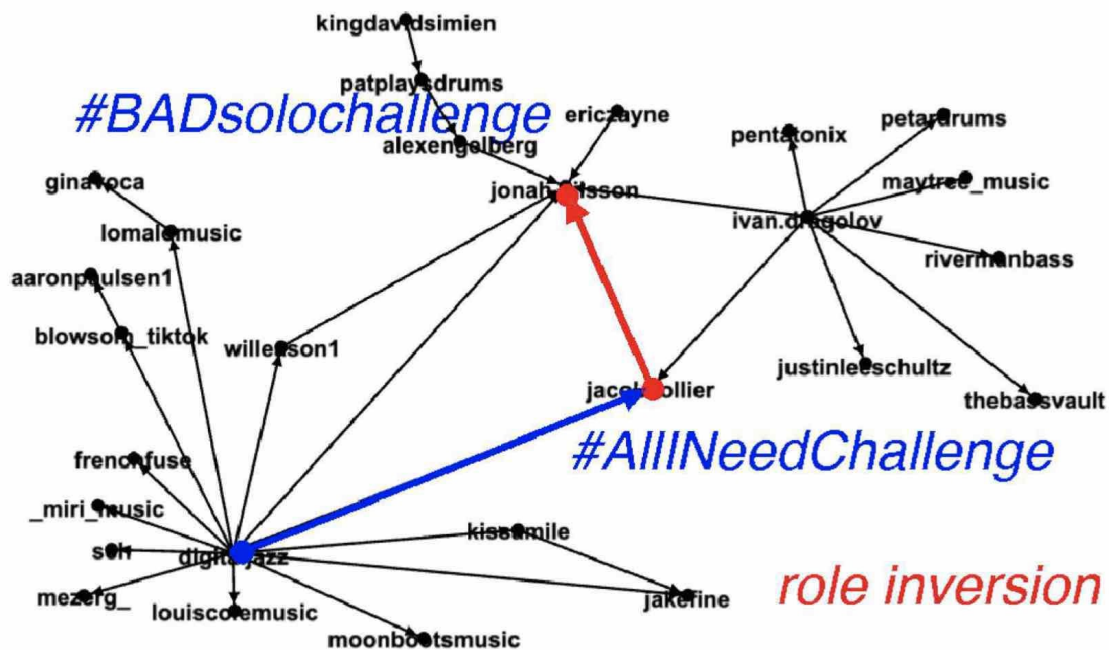


Figure 7 : A chain with role reversal by @jacobcollier

This chain is an example of role reversal. Jacob Collier, the famous talented young British musician born in 1994, who is very active on TikTok and makes a lot of duets, proposed in this case the #allIneedchallenge for which @digitaljazz made a duet. His challenge was related to his song “All I Need” with Mahalia and Ty Dolla \$ign from his album *Djesse Vol. 3* (Decca, 2020). But Jacob Collier did himself a duet for the #badsolochallenge proposed by Jonah Nilsson, and therefore changed his role from accompaniment to soloing. Both Jacob Collier and Jonah Nilsson knew each other from playing together at the Montreux Jazz Festival in 2017, and they collaborated on the song “Independent Girl” from the aforementioned album *Now or Never* by Jonah Nilsson. Role reversal is encouraged by the current trend for musicians to be highly multi-skilled, playing keyboards, drums, guitars and so on. In the original video of the #allIneedchallenge<sup>31</sup>, the video montage shows Jacob Collier playing three different instruments: keyboard, drums and bass.

The last graph (figure 8) was produced automatically while the previous one was constructed both automatically and manually by refining the data and selecting only the duet relationships. The latter graph is obtained from users identified from an online ethnographic survey that we are conducting and they regularly practice duets. The presence of many source nodes reflects their online music activity and their connection to other musicians, via features like TikTok duets. Here you can see double arrows, which means that roles are not clearly separated and that role reversal is frequent within these duet communities: two musicians can make a video with one role distribution and make another video where this distribution is reversed. Indeed, the survey reveals the real nature of these role inversions. They are often reciprocal duets (a musician makes a duet with another, and then the latter makes a duet with the first one), but there may correspond to other kind of relationship. It might be mentions by users who repost the videos of other users who participated in their duets. And it might also be video responses to comments (for example @garnetwaltersmusic responds to @tylarhairston as we shall see). Webscraping provides a broader view of these relationships between TikTok musicians.

31 Jacob Collier's #allIneedchallenge: <https://www.tiktok.com/@jacobcollier/video/6904363405713362178>



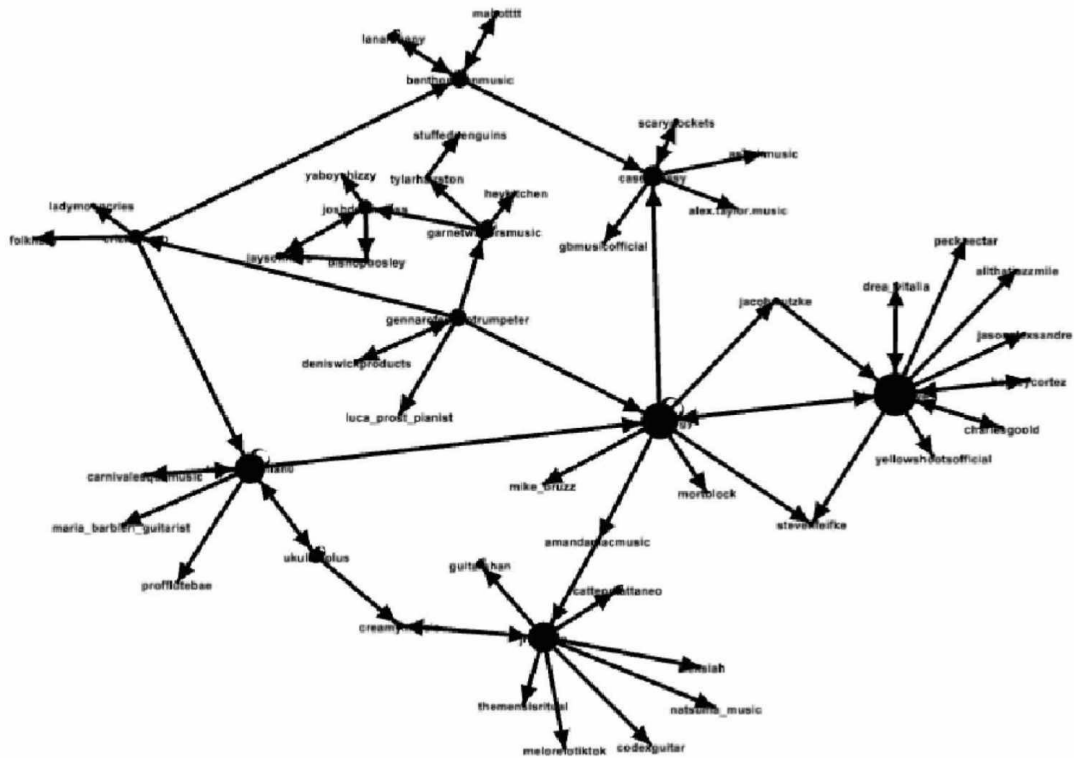


Figure 8 : A more complex graph with duos and others relationships.

A “video comment response” is a TikTok feature that allows a user to reply to a comment by creating a new video where the comment is automatically displayed on the screen. Such an interaction between users is not the result of a deferred collective creation between musicians as in the case of a duet, but it is nevertheless a feature that allows exchanges about music and is used by TikTok musicians. Here the pianist @garnetwaltermusic responds to the guitarist @tylarhairston who makes a remark in the comments space of a previous video in which @garnetwaltermusic proposes a duet by playing a sequence of chords to be reused. Then in the comment section, @jayaveli23 asked if this chord progression could be inspired by an existing piece of music. His comment was complemented by @tylarhairston who suggested that what @garnetwaltermusic is playing may be reminiscent of the Kirk Franklin's song “When” from his album *Losing My Religion* (RCA Inspiration, 2015)<sup>32</sup>. In his response video @garnetwaltermusic plays the part again which indeed sounds similar confirming @tylarhairston's observation<sup>33</sup>. Actually, the chord progression was very close to the vocal polyphony played in the introduction of Kirk Franklin's song “When”. Web scraping here highlights an exchange that demonstrates a real musical relationship between the two musical users. Web scraping allows to access to an overview of the relationships between TikTok musicians, but an ethnographic survey still seems important in order to verify the nature of the exchanges recorded by the API.

## Conclusion

As we have seen in this article, musical practices on TikTok considerably renew the issues related

32 Original video by @garnetwaltermusic with comment by @tylarhairston:

<https://www.tiktok.com/@garnetwaltermusic/video/7087303631313194283>

33 Video comment response by @garnetwaltermusic with the mention “Reply to @tylarhairston”:

<https://www.tiktok.com/@garnetwaltermusic/video/7091693576127630634>

to musical communities. The work presented here is part of a project dedicated to idiomatic improvisation with computer, and it is interesting from this point of view, to deepen the study of the characteristics specific to the musical communities appearing on the network. One of the richest features of TikTok in terms of collaboration between musicians is the duet function which allows one to add a musical part to an existing video. This article takes a fresh look at the links that are woven through this practice by implementing a web scraping computer program. This allows us to draw the graph of all the musicians who collaborate with one or more given musicians thanks to the duo function of TikTok.

The visual representation of these graphs in the form of nodes and arrows reveal certain characteristics specific to this type of musical collaboration. It brings up sources (i.e. musicians who do a lot of duets with existing videos) and sinks (i.e. musicians offering videos that many others duet with). This distinction must undoubtedly be linked to the popularity of users because intuition suggests that those who offer duets are better known than those who make duets with them and who see this as a way to increase their popularity, but this point deserves further quantitative study. From a musical point of view, these two categories roughly cover the distinction between soloist musician and accompanying musician, but there too the reality is more subtle (for example an a cappella singer, therefore a priori soloist, can give birth to a duo with someone one wanting to accompany his singing). All sorts of nuances exist and the fact that these categories are not clear-cut is perhaps linked to the observation that many young musicians tend to be poly-instrumentalists. In the graph, some configurations show these cases of confusion between categories. For example, the duet chains correspond to duets on existing duets, in which the roles are mixed. Finally, the paths in the graph during which the arrows alternately change direction reflect role reversals, that is to say that a soloist playing with a musician becomes an accompanist with another.

**Fundings:** This research is supported by the European Research Council (ERC) REACH project, under Horizon 2020 programme (Grant 883313) and by Agence Nationale de la Recherche (ANR) project MERCI (Grant ANR-19-CE33-0010).