

Set-up of the Experiments in Instance Classification using Co-Occurrences on the Web

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1 Music Artist Classification

We have classified the artists in Peter Knees' data set³.

By adding synonyms to some of genres, this resulted in the following input file:

```
c: artist[Johnny Cash; Willie Nelson ; Dolly Parton ; Hank Williams ; Faith Hill ;  
Dixie Chicks ; Garth Brooks ; Kenny Rogers ; Tim McGraw; Hank Snow ; Brooks and Dunn ;  
Lee Hazlewood ; Kenny Chesney ; Jim Reeves ; Roger Miller ; Kris Kristofferson ;  
Bob Dylan; Joni Mitchell; Leonard Cohen; Joan Baez; Townes van Zandt; Pete Seeger;  
Suzanne Vega; Tracy Chapman; Tim Buckley; Steeleye Span; Woodie Guthrie; Donovan;  
Cat Stevens; John Denver; Don McLean; Crosby Stills & Nash; Miles Davis; Dave Brubeck;  
Billie Holiday; Duke Ellington; Django Reinhardt; Glenn Miller; Ella Fitzgerald;  
Louis Armstrong; Nat King Cole; Herbie Hancock; Nina Simone; John Coltrane;  
Charlie Parker; Count Basie; Thelonious Monk; Cannonball Adderley; John Lee Hooker;  
Muddy Waters; Taj Mahal; John Mayall; Big Bill Broonzy; BB King; Howlin' Wolf;  
Willie Dixon; Blind Lemon Jefferson; Blind Willie McTell; Mississippi John Hurt;  
T-Bone Walker; Etta James; Lightnin' Hopkins; Otis Rush; Albert King; James Brown;  
Marvin Gaye; Otis Redding; Solomon Burke; Sam Cooke; Aretha Franklin; Al Green;  
The Temptations; The Drifters; Fats Domino; The Supremes; Isaac Hayes; Alicia Keys;  
Erykah Badu; India Arie; Jill Scott; Iron Maiden; Megadeth; Slayer; Sepultura;  
Black Sabbath; Anthrax; Alice Cooper; Deep Purple; Def Leppard;  
AC/DC; Judas Priest; Kiss; Metallica; Pantera; Queensryche; Skid Row; Nirvana; Beck;  
Smashing Pumpkins; Radiohead; Belle and Sebastian; Alice in Chains; Echo and the Bunnymen;  
Sonic Youth; Weezer; Pearl Jam; Foo Fighters; Hole; Bush; The Smiths; Depeche Mode;  
Jane's Addiction; Patti Smith; Sex Pistols; Sid Vicious; Ramones; Bad Religion; The Clash;  
NoFX; Dead Kennedys; Buzzcocks; Green Day; Blink 182; Sum 41; The Misfits; Rancid;  
Screeching Weasel; Pennywise; Eminem; Dr. Dre; Public Enemy; Missy Elliot; Cypress Hill;  
50 Cent; Run DMC; Grandmaster Flash; 2Pac; Snoop Dogg; Jay-Z; Busta Rhymes; LL Cool J; DMX;  
Ice Cube; Mystikal; Aphex Twin; Daft Punk; Kraftwerk; Chemical Brothers; Fatboy Slim;  
Basement Jaxx; Carl Cox; Moloko; Paul Oakenfold; Prodigy; Armand van Helden; Moby;  
Massive Attack; Mouse on Mars; Jimi Tenor; Underworld; Bob Marley; Jimmy Cliff;  
Peter Tosh; Ziggy Marley; Sean Paul; Alpha Blondie; Shaggy; Maxi Priest; Shabba Ranks;  
UB40; Inner Circle; Desmond Dekker; Capleton; Bounty Killer; Eddy Grant; Black Uhuru;  
The Rolling Stones; The Animals; The Faces; The Kinks; The Who; Elvis Presley; Chuck Berry;  
Little Richard; Jerry Lee Lewis; Buddy Holly; Bo Diddley; Bill Haley; Chubby Checker;  
The Yardbirds; Carl Perkins; Gene Vincent; Madonna; Britney Spears; N'Sync;  
Justin Timberlake; ABBA; Michael Jackson; Janet Jackson; Prince; Spice Girls;  
Christina Aguilera; Robbie Williams; Nelly Furtado; Avril Lavigne; Jennifer Lopez;  
O-Town; Shakira ; Wolfgang Amadeus Mozart ; Ludwig van Beethoven ; Johann Sebastian Bach ;  
Joseph Haydn ; Johannes Brahms ; Frederic Chopin ; Antonin Dvorak ; Gustav Mahler ;
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³ <http://www.cp.jku.at/people/knees/artistlist224.html>

Franz Schubert ; Antonio Vivaldi ; Richard Wagner ; Herbert von Karajan ; Yehudi Menuhin ;
Georg Friedrich Haendel ; Tchaikovsky ; Giuseppe Verdi]

c: genre[country; folk; jazz ; blues; r n' b ; r 'n' b ; r n b ; rnb ; soul ; heavy metal ;
metal ; hard rock ; alternative rock ; hard alternative ; indie ; punk ; rap ;
hip-hop ; hiphop ; electronica ; elektronica ; reggae ; classic rock ; rock 'n' roll ;
rock n roll ; rock & roll ; pop ; classical music]

For PM we used the following patterns for finding co-occurrences of artists and genres. #0 is a placeholder for an artists, where #1 is to be replaced by a genre.

```
rp music: "#1 artists like #0"  
rp music: "#1 artists such as #0"  
rp music: "#1 artists for example #0"  
rp music: "#0 and other #1 artists"  
rp music: "#1 musicians like #0"  
rp music: "#1 musicians such as #0"  
rp music: "#1 musicians for example #0"  
rp music: "#0 and other #1 musicians"  
rp music: "#1 bands like #0"  
rp music: "#1 bands such as #0"  
rp music: "#1 bands for example #0"  
rp music: "#0 and other #1 bands"  
rp music: "#1 acts like #0"  
rp music: "#1 acts such as #0"  
rp music: "#1 acts for example #0"  
rp music: "#0 and other #1 acts"
```

For the pattern-based finding of co-occurrences between artists, the following patterns were used.

```
rp music: "like #0 and #1"  
rp music: "such as #0 and #1"  
rp music: "including #0 and #1"  
rp music: "for example #0 and #1"  
rp music: "namely #0 and #1"  
rp music: "#0 and #1"  
rp music: "#0, #1"
```

2 Painters Classification

The set I_s consists of the following painters, extracted from http://www.wikipedia.org/List_of_painters.

Hans von Aachen
Riza Abbasi
Edwin Austin Abbey
Nikolaj Abraham Abildgaard
Bernard Accama
Andreas Achenbach
Oswald Achenbach
Pieter Aertsen
Aetion
Yaacov Agam

Jacques-Laurent Agasse
Christoph Ludwig Agricola
Ivan Aivazovsky
Tadeusz Ajdukiewicz
Josef Albers
Mariotto Albertinelli
Kazimierz Alchimowicz
Pierre Alechinsky
Fedor Alekseev
Mikolas Ales
Else Alfelt
Alessandro Algardi
David Allan
Alessandro Allori
Cristofano Allori
Washington Allston
Lawrence Alma-Tadema
Charles Alston
Albrecht Altdorfer
Altichiero
Jacopo Amigoni
Rodolfo Amoedo
Anna Ancher
Michael Peter Ancher
Carl Andre
Ran Andrews
Fra Angelico
Sofonisba Anguissola
Richard Anuszkiewicz
Apelles
Zvest Apollonio
Karel Appel
Felix Arauz
Giussepe Arcimboldo
Jean Arp
John James Audubon
George Ault
Jean-Michel Atlan
Frank Auerbach
Jules Robert Auguste
Hendrick Avercamp
Milton Avery
Hovhannes Ayvazovski
Constantine Andreou
Marcello Bacciarelli
Francis Bacon
William Jacob Baer
Albert Baertsoen
Leonard Bahr
Ludolf Bakhuysen
Lon Bakst
Hans Baldung
Robert Ballagh
Vincenzo Balsamo

Balthus
Edward Mitchell Bannister
Bapu
William Barak
Vladimir Baranoff-Rossine
Giovanni Francesco Barbieri
George Barker
Ernie Barnes
James Barry
Hans von Bartels
Richmond Barthe
Jennifer Bartlett
Fra Bartolommeo
Francesco Bartolozzi
Georg Baselitz
Marie Bashkirtseff
Jean-Michel Basquiat
Jacopo Bassano
Robert Bateman
Robert Bateman
David Bates
Maxwell Bates
Juan Bautista Garcia
James Baynes
Thomas Mann Baynes
Pompeo Girolamo Batoni
Frdric Bazille
Romare Bearden
Cecilia Beaux
Robert Bechtle
Jasmine Becket-Griffith
Max Beckmann
Ignat Bednarik
Captain Beefheart
Kamaleddin Behzad
Zdzislaw Beksinski
Giovanni Bellini
Gentile Bellini
Jacopo Bellini
Vanessa Bell
Bernardo Bellotto
George Wesley Bellows
Ludwig Bemelmans
Martin Benka
Wilhelm Bendz
Frank Weston Benson
Thomas Hart Benton
Alexander Benois
Emerik Bernard
Janez Bernik
Gian Lorenzo Bernini
Elsa Beskow
Henryka Beyer
George Biddle

Albert Bierstadt
Ivan Bilibin
Anna Bilinska-Bohdanowiczowa
Ejler Bille
Henry Billings
George Caleb Bingham
S J "Lamorna" Birch
Thierry Bisch
Wilhelm Bissen
Basil Blackshaw
William Blake
Ralph Albert Blakelock
Arnold Blanch
Ross Bleckner
Carl Bloch
Izaak van den Blocke
Peter Blume
David G. Blythe
Franois Bocion
Arnold Bcklin
Karl Bodmer
Krzysztof Boguszewski
Aaron Bohrod
Maurice Boitel
David Bomberg
Rosa Bonheur
Claude Bonin-Pissarro
Richard Parkes Bonington
Pierre Bonnard
Francesco Bonsignori
Bogdan Borcic
Paul-mile Borduas
Vladimir Borovikovsky
Hieronymus Bosch
Ambrosius Bosschaert
Angel Botello
Fernando Botero
Sandro Botticelli
Franois Boucher
Eugne Boudin
William-Adolphe Bouguereau
Arthur Boyd
P. Rostrup Byesen
Olga Boznanska
Louis Bouch
Robert Brackman
Jozef Brandt
Georges Braque
Alan Bray
Carl Fredrik von Breda
George Hendrik Breitner
Jules Breton
Breyten Breytenbach
Pierre Brissaud

Louis le Brocquy
Ann Brockman
Antoni Brodowski
Agnolo Bronzino
Alexander Brook
Allan Brooks
Bertram Brooker
Ford Madox Brown
Rush Brown
Jan Brueghel the Elder
Jan Brueghel the Younger
Pieter Brueghel the Elder
Pieter Brueghel the Younger
Karl Briullov
Tadeusz Brzozowski
Bernard Buffet
Elbridge Ayer Burbank
Charles Ephraim Burchfield
William Partridge Burpee
Alexander Bugan
Louis Buvelot
John Byrne
Lilla Cabot Perry
Pogus Caesar
Gustave Caillebotte
Alexander Calder
Jacques Callot
Canaletto
Josef Capek
Tom Carapic
Caravaggio
Ivan Cargo
John Fabian Carlson
Emile Auguste Carolus-Duran
Carpaccio
Emily Carr
Annibale Carracci
Agostino Carracci
Cazasoles
Ludovico Carracci
Mary Cassatt
Alfred Joseph Casson
George Catlin
Avgust Cernigoj
Bartolomeo Cesi
Paul Czanne
Marc Chagall
Minerva J. Chapman
Jean-Baptiste-Simon Chardin
Caroline Chariot-Dayez
Michael Ray Charles
Nicolas Charlet
William Merritt Chase
Pierre Puvis de Chavannes

Jozef Chelmonski
Giorgio de Chirico
Omar Chkhaidze
Adam Chmielowski
Daniel Chodowiecki
Anthony Christian
Frederick Edwin Church
Winston Churchill
Leon Chwistek
Tomasz Ciecierski
Cimabue
Joze Ciuha
Franz Cizek
Francois Clouet
Giorgio Giulio Clovio
Charles Codman
Thomas Cole
Evert Collier
John Collier
Jean Colombe
John Constable
Constant
CA. M. Coolidge
D.D. Coombs
John Singleton Copley
Lovis Corinth
Corneille
Thomas Cornell
Jean-Baptiste Camille Corot
Correggio
Pietro da Cortona
Piero di Cosimo
Francesco del Cossa
Pierre Auguste Cot
Noel Counihan
Gustave Courbet
Thomas Couture
Lucas Cranach the elder
Lucas Cranach the younger
Vivian Crettol
Carlo Crivelli
Charles Crodel
Jean Crotti
Thomas Crotty
Aelbert Cuyp
Boleslaw Cybis
Jan Cybis
Cydney
Wladyslaw Czachorski
Jozef Czapski
Szymon Czechowicz
Tytus Czyzewski
Richard Dadd
Michael Dahl

Christen Dalsgaard
Salvador Dal
Charles-Francois Daubigny
Honor Daumier
Gerard David
Jacques Louis David
Leonardo da Vinci
Gene Davis
Stuart Davis
Riko Debenjak
Jean Baptiste Debret
Stanislaw Debicki
Joseph DeCamp
Edgar Degas
Ettore "Ted" DeGrazia
Christian De Calvairac
Michel De Caso
Raoul De Keyser
Eugne Delacroix
Emir -Zeko- Delalic
Beauford Delaney
Robert Delaunay
Sonia Delaunay-Terk
Paul Delvaux
Charles Demuth
Maurice Denis
Andr Derain
Edouard Detaille
Thomas Dewing
Richard Diebenkorn
Mary Dignam
Meredith Dillman
Abidin Dino
Dionisy
Paul Dirmeikis
Otto Dix
Andrzej Dluzniewski
Jan Dobkowski
William Dobson
Theo van Doesburg
Eppo Doeve
Tommaso Dolabella
Tadeusz Dominik
Gustave Dor
Kees van Dongen
Dosso Dossi
Christian Dotrement
Jacques Doucet
Thomas Doughty
Aaron Douglas
Rackstraw Downes
Willem Drost
Russell Drysdale
Jean Dubuffet

Duccio
Marcel Duchamp
Suzanne Duchamp-Crotti
Raoul Dufy
Anne Dunn
Albrecht Drer
Sir Anthony van Dyck
Thomas Eakins
Alfred East
Christoffer Wilhelm Eckersberg
Otto Eckmann
Don Eddy
Albert Edelfelt
Beverly K. Effinger
Eugeniusz Eibisch
Ib Eisner
Kano Eitoku
Adam Elsheimer
Gederts Eliass
Ron English
James Ensor
Sir Jacob Epstein
Max Ernst
M.C. Escher
Richard Estes
William Etty
Dulah Marie Evans
Mikhail Evstafiev
Jan van Eyck
Gentile da Fabriano
Carel Fabritius
Pietro Faccini
Julian Falat
Aniello Falcone
Robert Falk
Alexandre Falguire
Henri Fantin-Latour
Jean Fautrier
Jerzy Fedkowicz
Pavel Fedotov
Lyonel Feininger
Feofan Grek
Stanislaw Fijalkowski
Pavel Filonov
Leonor Fini
Andrea da Firenze
Alvan Fisher
James Montgomery Flagg
Lucio Fontana
Clinton Ford
Tsuguharu Foujita
Jean Fouquet
Jean-Honore Fragonard
Art Frahm

Piero della Francesca
Franois Louis Thomas Francia
Sam Francis
Simon Francis
Helen Frankenthaler
Frank Frazetta
Wilhelm Freddie
Charles Alphonse du Fresnoy
Lucian Freud
Caspar David Friedrich
Frederick Carl Frieseke
Nicolas Froment
Brian Froud
Ludovit Fulla
Henry Fuseli
Thomas Gainsborough
Akseli Gallen-Kallela
Byron Galvez
Thomas Gambier Parry
Antonio de la Gandara
Norman Garstin
Ian Gaskell
Paul Gauguin
Nikolai Ge
William Gear
Ilka Gedo
Geertgen tot Sint Jans
Aert de Gelder
Artemisia Gentileschi
Orazio Gentileschi
Aleksandr Gerasimov
Thodore Gricault
Jean-Lon Grme
Wojciech Gerson
Domenico Ghirlandaio
Alberto Giacometti
Khalil Gibran
Stefan Gierowski
Aleksander Gierymski
Maksymilian Gierymski
Stephen Gilbert
Giorgione
Giotto
Francois Girardon
Ilya Glazunov
John William Godward
Leo Goetz
Vincent van Gogh
Leon Golub
Natalia Gontcharova
Eva Gonzals
Giovan Francesco Gonzaga
Frederick Goodall
Arshile Gorky

Jan Gotard
Adolph Gottlieb
Leopold Gottlieb
Maurycy Gottlieb
Francisco Goya
Jan van Goyen
Anton Graff
Eugne Grasset
El Greco
Tony Green
HAP Grieshaber
Juan Gris
Giuseppe Grisoni
Ivan Grohar
George Grosz
Artur Grottger
Isaac Grunewald
Matthias Grnewald
Aleksander Gryglewski
Francesco Guardi
Albert Guillaume
Olaf Gulbransson
Philip Guston
Heinz Guth
Herman Gvardjancic
Mikolaj Haberschrack
Frans Hals
Richard Hamilton
Wilhelm Hammershoi
Nina Hamnett
Herman Han
Constantin Hansen
Niels Hansen
Svend Wiig Hansen
William Harnett
Lawren Harris
Tracy Harris
Marsden Hartley
Hans Hartun
Childe Hassam
Rudolf Hausner
Louis Hayet
Francesco Hayez
Martin Johnson Heade
Jeanne Hbuterne
Henry Heerup
Jan Davidsz de Hem
Robert Henri
Louis Hersent
Magnus Colcord Heurlin
Prudence Heward
Hugo Heyrman
Edward Hicks
Thomas Hicks

Kaii Higashiyama
Derek Hill
Karol Hiller
Sigrid Hjertn
Prince Hoare
William Hoare
Meindert Hobbema
David Hockney
Howard Hodgkin
Ferdinand Hodler
Ernst Theodor Amadeus Hoffmann
Vlastimil Hofman
Hans Hofmann
William Hogarth
Hokusai
Ambrosius Holbein
Hans Holbein the Elder
Hans Holbein the Younger
Winslow Homer
Alejandro Honda
Villard de Honnecourt
Gerald van Honthorst
Pieter de Hooch
Eric Hopkins
Charles Hopkinson
Edward Hopper
John Bradley Hudson Jr.
MF Hussain
Pieter Huys
Jan van Huysum
Jrg Immendorff
Jean Auguste Dominique Ingres
George Inness
Dahlov Ipcar
Adriaen Isenbrant
Jozef Israels
Alexander Ivanov
Egill Jacobsen
Yvonee Jacqueline
Eero Jrnefelt
Bozidar Jakac
Rihard Jakopic
Matija Jama
Ruud Janssen
Maria Jarema
Wladyslaw Jarocki
Alexej von Jawlensky
Louis Janmot
Andrej Jemec
Zmago Jeraj
Boris Jesih
Ferenc Joachim
Augustus John
Gwen John

Jasper Johns
Mitchell Johnson
Sargent Johnson
Allen Jones
Lois Mailou Jones
Jacob Jordaens
Asger Jorn
Donald Judd
Jens Juel
Frida Kahlo
Willem Kalf
Jitish Kallat
Kamagurka
Wassily Kandinsky
Paul Kane
Rajmund Kanelba
Tadeusz Kantor
Leon Kaplinski
Mohammad Karami Golpaygan
Rabo Karabekian
Alfons Karpinski
Nikolai Alekseyevich Kasatkin
Wincenty Kasprzycki
Alex Katz
Angelica Kauffmann
Ferdinand Keller
Ellsworth Kelly
Rockwell Kent
Anselm Kiefer
William Kienbusch
Michel Kikoine
Thomas Kinkade
Ernst Ludwig Kirchner
Per Kirkeby
Moise Kisling
Roar Kjernstad
Paul Klee
Yves Klein
Gustav Klimt
Franz Kline
Juraj Julije Klovic
Boris Kobe
Marcin Kober
Aleksander Kobzdej
Roman Kochanowski
Robert Koehler
Oskar Kokoschka
Kthe Kollwitz
Willem de Kooning
Jeff Koons
Frans Koppelaar
Lukasz Korolkiewicz
Jerzy Kossak
Juliusz Kossak

Wojciech Kossak
Franciszek Kostrzewski
Rudolf Kotnik
Aleksander Kotsis
Felicjan Szczesny Kowarski
Franc Kralj
Tone Kralj
Ivan Kramskoi
Metka Krasovec
Janina Kraupe-Swidarska
Andre de Krayewski
Emil Krcha
Albert Henry Krehbiel
Pinchus Kremegne
Christian Krogh
Per Krohg
Leon Kroll
Peder Severin Kryer
Fan Kuan
Konrad Krzyzanowski
Arkhip Kuindzhi
Yasuo Kuniyoshi
Frantisek Kupka
Alexander V. Kuprin
Jeffrey Kurland
Yayoi Kusama
Boris Kustodiev
Majka Kwiatowska
Christen Kbke
Adelaide Labille-Guiard
Georges Lacombe
Wilfredo Lam
Aleksandr Ivanovich Laktionov
Nicolas Lancret
Myra Landau
Sir Edwin Landseer
Fitz Hugh Lane
Giovanni Lanfranco
Peter Lanyon
Gene Lambert
Karol Larisch
Carl Larsson
Georges de La Tour
Marc Laurencin
Marie Laurencin
Ludwik de Laveaux
Jacob Lawrence
Sir Thomas Lawrence
Jan Lebenstein
Charles Lebrun
Jules Joseph Lefebvre
Fernand Lger
Lord Frederic Leighton
Margaret Leiteritz

Franciszek Lekszycki
Sir Peter Lely
Ulrich Leman
Robert Lenkiewicz
Franz von Lenbach
Stanislaw Lentz
Mikhail Yuryevich Lermontov
Emanuel Leutze
Isaac Levitan
Dmitry Levitzky
Wyndham Lewis
Lucas van Leyden
Andr Lhote
Roy Lichtenstein
Max Liebermann
Bruno Andreas Liljefors
Limbourg brothers
Bronislaw Wojciech Linke
John Linnell
Filippino Lippi
Fra Filippo Lippi
Arthur Lismer
El Lissitzky
Leopold Loeffler
Lojze Logar
Leonard Long
McKendree Long
Charles-Andr van Loo
Charles-Amde-Philippe van Loo
Jean-Baptiste van Loo
Louis-Michel van Loo
Pietro Lorenzetti
Lazzaro Luxardo
Claude Lorrain
L. S. Lowry
Maximilien Luce
Lucebert
Labro Raphael
George Benjamin Luks
Laura Muntz Lyall
Jan Mabuse
Stanton Macdonald-Wright
August Macke
Daniel Maclise
Conroy Maddox
Carlo Maderna
John Maggs
Ren Magritte
Aristide Maillol
Hans Makart
Konstantin Makovsky
Tadeusz Makowski
Zbigniew Makowski
Kees Maks

Vladimir Makuc
Jacek Malczewski
Rafal Malczewski
Wladyslaw Malecki
Kazimir Malevich
Man Ray
Alfred Manessier
Edouard Manet
Miltos Manetas
Andrea Mantegna
Niklaus Manuel
Franz Marc
Louis Marcoussis
Adam Marczynski
Brice Marden
John Marin
Regia Marinho
Jacob Maris
Matthijs Maris
Willem Maris
Theodore Major
Jacques Maroger
Wilhelm Marstrand
Jozef Marszewski
John Martin
Simone Martini
Andrey Martynov
Tommaso Masaccio
Frans Masereel
Stanislaw Maslowski
Masolino
Frank Mason
Jan Matejko
Henri Matisse
Quentin Matsys
Roberto Matta
Antonio Mattei
Paul Mavrides
Peter Max
Linda Mears
Sheila McClean
Frederick McCubbin
Bruce McLean
Richard McLean
Catherine McWilliams
Joseph McWilliams
Hendrik Willem Mesdag
Jozef Mehoffer
Victor Meirelles
Ernest Meissonier
Vadym Meller
Arthur Melville
Hans Memlinc
Milton Menasco

Zygmunt Menkes
Adolph Menzel
Luc-Olivier Merson
Youri Messen-Jaschin
Antonello da Messina
Willard Metcalf
Antoni Michalak
Piotr Michalowski
Henri Michaux
Michelangelo Buonarroti
Leo Michelson
Eugeen Van Mieghem
France Mihelic
Kazimierz Mikulski
Francis Davis Millet
Jean-Francois Millet
Joan Mir
Augustyn Mirys
Amedeo Modigliani
Lszl Moholy-Nagy
Anton Moller
Piet Mondrian
Claude Monet
Thomas Moran
Giorgio Morandi,
Gustave Moreau
Camilo Mori
Berthe Morisot
Malcolm Morley
Samuel F. B. Morse
Mary Moser
Robert Motherwell
Alfons Mucha
Friedrich Muller
Edvard Munch
Gabriele Munter
Bartolome Esteban Murillo
Edo Murtic
Zoran Music
Menez
Patrick Nagel
Albert Namatjira
Paul Nash
Alexander Nasmyth
Patrick Nasmyth
Nattier
Bruce Nauman
Alice Neel
Almada Negreiros
LeRoy Neiman
Odd Nerdrum
Ugo Nespolo
Mikhail Nesterov
Louise Nevelson

Barnett Newman
Ejnar Nielsen
Jan Nieuwenhuys
Ben Nicholson
Nicomachus of Thebes
Alexander O. Nikulin
Isamu Noguchi
Sidney Nolan
Kenneth Noland
Emil Nolde
Max Magnus Norman
Leonard Ochtman
Juan O'Gorman
Georgia O'Keeffe
Claes Oldenburg
J.H. Ferdinand Olivier
John Opie
Andrea Orcagna
William Quiller Orchardson
Bryan Organ
Davide Orler
Emil Orlik
Aleksander Orłowski
Jos Clemente Orozco
Sir William Orpen
Manuel Ortiz de Zarate
Erik Ortvad
Adriaen van Ostade
Outamaro
Johann Friedrich Overbeck
Auseklis Ozols
T.K. Padmini
Kalervo Palsa
Pamphilus
Giovanni Paolo Pannini
Jozef Pankiewicz
Parmigianino
Maxfield Parrish
Pascin
George Passantino
Gen Paul
Julius Paulsen
Raphael Peale
Max Pechstein
Carl-Henning Pedersen
Viggo Pedersen
Waldo Peirce
Sophie Pemberton
Relja Penezic
Matteo Perez d'Aleccio
Vasily Perov
Lilla Cabot Perry
Perugino
Jozef Petkovsek

John F. Peto
Theodor Philipsen
Tom Phillips
Pedro Pedraja
Pietro Pezzati
Henryk Piatkowski
Giovanni Battista Piazzetta
Francis Picabia
Pablo Picasso
Paloma Picasso
Ramon Pichot
Otto Piene
Delilah Pierce
Waldo Pierce
Carl Gustaf Pilo
Veno Pilon
Howardena Pindell
Pinturicchio
Pisanello
Camille Pissarro
Antoni Pitxot
Stefan Planinc
Jan Bogumil Plersch
Kazimierz Pochwalski
Wladyslaw Podkowinski
Marjan Pogacnik
Vasily Polenov
Serge Poliakoff
Sigmar Polke
P.H. Polk
Jackson Pollock
Liubov Popova
Stefan Popowski
Fairfield Porter
Candido Portinari
Paulus Potter
Fuller Potter
Piotr Potworowski
Nicolas Poussin
Andrea Pozzo
Marij Pregelj
Nelson Primus
Maurice Prendergast
Mary Elizabeth Price
Alice Prin
Andrzej Pronaszko
Zbigniew Pronaszko
Samuel Prout
Tadeusz Pruszkowski
Witold Pruszkowski
Janez Puhar
Patrick Pye
Domenico Quaglio the Younger
Erasmus Quellinus the Elder

Jacopo della Quircia
August Querfurt
Jan Maurits Quinckhardt
Zygmunt Radnicki
Sir Henry Raeburn
Karl Rahl
Francesco Raibolini
Allan Ramsay
Raphael
Dorning Rasbotham
Robert Rauschenberg
Edward Willis Redfield
Tommaso Redi
Odilon Redon
Pierre-Joseph Redoute
Robert Reid
Rembrandt Harmenszoon van Rijn
Frederic Remington
Guido Reni
Pierre-Auguste Renoir
Pierre R. Renoir
Ilya Yefimovich Repin
Sir Joshua Reynolds
Susan Elizabeth Rice
Gerhard Richter
Hyacinthe Rigaud
Bridget Riley
Jean-Paul Riopelle
Arturo Rivera
Diego Rivera
Larry Rivers
Tom Roberts
Elizabeth B. Robinson
Theodore Robinson
Norman Rockwell
Henryk Rodakowski
Alexandr Rodchenko
Nicholas Roerich
Svetoslav Roerich
Christian Rohlfs
Fedor Rokotov
Oswaldo Romberg
George Romney
Anton Rooskens
Jan Henryk Rosen
James Rosenquist
Alexander Roslin
Bob Ross
Mark Rothko
Georges Rouault
Henri Rousseau
Thodore Rousseau
Peter Paul Rubens
Andrei Rublev

Hanna Rudzka-Cybisowa
Jacob van Ruisdael
Phillip Otto Runge
Edward Ruscha
Nadya Rusheva
Robert Russ
Charles Marion Russell
Jan Rustem
Ferdynand Ruszczyc
Rachel Ruysch
Andrei Ryabushkin
Tadeusz Rybkowski
Czeslaw Rzepinski
Raja Ravi Varma
Betye Saar
Pieter Jansz Saenredam
Artur Nacht Samborski
Stanislaw Samostrzelnik
John Singer Sargent
Andrea del Sarto
Raymond Saunders
Anne Savage
Jenny Saville
Alexei Kondratyevich Savrasov
Jan Sawka
Egon Schiele
Rudolf Schlichter
Art Paul Schlosser
Richard Schmid
George Schmidt
Karl Schmidt-Rottluff
Julian Schnabel
P. A. Schou
Karl Schrag
Daniel Schultz
Kurt Schwitters
William Edouard Scott
Felipe Seade
Charles Sebree
Maksim Sedej
Olaf Carl Seltzer
Jacek Sempolinski
Zinaida Serebryakova
Valentin Aleksandrovich Serov
Georges Seurat
Gino Severini
Joseph Severn
Ivan Shishkin
Ram Chandra Shukla
Kazimierz Sichulski
Walter Sickert
Zygmunt Sidorowicz
Henryk Siemiradzki
Paul Signac

Hugo Simberg
Jozef Simmler
David Alfaro Siqueiros
Alfred Sisley
Joakim Skovgaard
Niels Skovgaard
P.CA. Skovgaard
Ludomir Slendzinski
Wladyslaw Slewinski
Harald Slott-Moller
Frank E. Smith
Guinever Smith
Matthew Smith
Hinko Smrekar
Franciszek Smuglewicz
Sylvia Snowden
Marek Sobczyk
Leszek Sobocki
Koloman Sokol
Anton Solomoukha
Konstantin Somov
Jens Sndergaard
Camille Souter
Chaim Soutine
Litsa Spathi
Nicolas de Stal
Lojze Spacal
Austin Osman Spare
Niles Spencer
Carl Spitzweg
Carl Sprinchron
Jan Spsychalski
Kazimierz Stabrowski
Jerzy Stajuda
Jan Stanislawski
Wojciech Korneli Stattler
Henryk Stazewski
Andrzej Stech
Jan Steen
Kajetan Stefanowicz
Hannes Steinert
Jacob Steinhardt
Eduard von Steinle
Thophile Steinlen
Frank Stella
Matej Sternen
Clyfford Still
Stan Stokes
Myron Stout
David Stowe
Frans Straathof
Robert Strange
Arthur Streeton
Bartlomiej Strobel

Vonn Strpp
Drew Struzan
Zofia Stryjenska
Wladyslaw Strzeminski
Gilbert Stuart
George Stubbs
Gabrijel Stupica
Sava Sumanovic
January Suchodolski
Serge Sudeikin
Vasily Surikov
George B. Sutherland
Eva vankmajerov
Henryk Szczyglinski
Jozef Szermentowski
Jerzy Eleuter Szymonowicz-Siemiginowski
Jean Tabaud
Enrique Tbara
Reuben Tam
Rufino Tamayo
Henry O. Tanner
Joseph Tany Yos Yama
Antoni Tpies
Edmund Charles Tarbell
Tomasz Tatarczyk
Vladimir Tatlin
Afewerk Tekle
David Teniers III
Hendrick Terbrugghen
Pietro Testa
Wlodzimierz Tetmajer
Abbott Handerson Thayer
Ellen Thesleff
Jan Theuninck
Wayne Thiebaud
Alma Thomas
Edward H. Thompson
Robert Thompson
Tom Thomson
CA. Thomsen
William Thon
Giovanni Battista Tiepolo
Tintoretto
Joze Tisnikar
James Tissot
Titian
Mark Tobey
Jozef Tominc
Tristan Tondino
Henri de Toulouse-Lautrec
Pierre Toutain-Dorbec
Fran Tratnik
Bill Traylor
Jan Tricius

Wincenty Trojanowski
Vasily Andreevich Tropinin
Clovis Trouille
John Trumbull
Werner Tubke
J.M.W. Turner
Laurits Tuxen
Luc Tuymans
John Henry Twachtman
Cy Twombly
Barbara Tyson-Mosley
Raoul Ubac
Paolo Uccello
Fritz von Uhde
William Unger
Michelangelo Unterberger
Simon Ushakov
Kitagawa Utamaro
Maurice Utrillo
Pierin Vaga
Gee Vaucher
Suzanne Valadon
Juan de Valds Leal
Felix Vallotton
Sir Anthony van Dyck
Victor Vasarely
Viktor Vasnetsov
Marie Vassilieff
Philipp Veit
Diego Velzquez
Henry van de Velde
Willem van de Velde the Elder
Willem van de Velde the Younger
Raja Ravi Varma
Vasily Vereshchagin
Fernand Verhaegen
Johannes Vermeer
Jan Cornelisz Vermeyen
Horace Vernet
Paolo Veronese
Andrea del Verrocchio
Joseph-Marie Vien
Elisabeth Vigee-Lebrun
Juan Villafuerte
Jacques Villon
Ivan Yakovlevich Vishnyakov
Boris Vladimirski
Maurice de Vlaminck
Simon de Vlieger
Zygmunt Vogel
Wolf Vostell
Simon Vouet
Sebasdtian Vrancx
Cornelisz Vroom

Mikhail Vrubel
Edouard Vuillard
Edward Wadsworth
Zygmunt Waliszewski
Laura Wheeler Waring
Alfred Wallis
Henry Wallis
Jacek Waltos
Wladyslaw Wankie
Walenty Wankowicz
Andy Warhol
Waclaw Wasowicz
John William Waterhouse
Antoine Watteau
Czeslaw Wdowiszewski
Carel Weight
J. Alden Weir
Wojciech Weiss
Elisabeth Wierzbicka Wela
Neil Welliver
Kurt Wenner
Gina Werfel
Adolf-Ulrik Wertmuller
Jakub Wessel
Tom Wesselmann
Benjamin West
Roger van der Weyden
James McNeill Whistler
Brett Whiteley
David Wilkie
Alan D. Williams
Adolphe Willette
Jens Ferdinand Willumsen
Richard Wilson
Emanuel de Witte
Konrad Winkler
Nancy Wisseman-Widrig
Stanislaw Witkiewicz
Stanislaw Ignacy Witkiewicz
Romuald Kamil Witkowski
Konrad Witz
Theo Wolvecamp
David Wojnarowicz
Kazimierz Wojniakowski
Witold Wojtkiewicz
John Christopher Wood
Christopher Wood
Grant Wood
Charles H. Woodbury
Mabel May Woodward
Michael W. Wooten
Philips Wouwerman
Joseph Wright of Derby
Andrzej Wroblewski

Paul Wunderlich
Leon Wyczolkowski
Jan Wydra
Andrew Wyeth
Jamie Wyeth
N.CA. Wyeth
Stanislaw Wyspianski
Ettore Ximenes
Nikolai Yaroshenko
Jack Butler Yeats
Joseph Yoakum
Konstantin Yuon
Ossip Zadkine
Christian Zahrtmann
Eugeniusz Zak
Marcin Zaleski
Jan Zamoyski
Peter M. Zawadzki
Flix Ziem
Franciszek Zmurko
Johann Zoffany
Marguerite Zorach
William Zorach
Anders Zorn
Francesco Zuccarelli
Federigo Zuccaro
Ignacio Zuloaga
Francisco de Zurbaran

The painters were mapped to the following set of movements in art.

Abstract Expressionism
Academic Art
African Art
American Regionalism
Ancient Art
Art Deco
Art Nouveau
Arte Povera
Arts and Crafts Movement
Ashcan School
Barbizon School
Baroque
Bauhaus
Beat Generation
Black Mountain College
Byzantine Art
Classical Chinese Art
Classical Japanese Art
CoBrA
Conceptual Art
Constructivism
Cubism
Cubo-Futurism

Dada and Surrealism
Der Blaue Reiter
Die Brücke
Etruscan Art
Expressionism
Fauvism
Fluxus
Folk, Self-Taught, and Outsider Art
Futurism
Golden Age of Illustration
Gothic Art
Graffiti Art
Greek Art
Group of Seven
Harlem Renaissance
Hudson River School
Impressionism
Indian River School
Land Art
Luminism
Magic Realism
Mannerism
Massurrealism
Medieval Art
Minimalism
Modernism
Nabis
Neo-Classicism
Neo-Expressionism
Neo-Plasticism
Optical Art
Orientalism
Photorealism
Pointillism
Pop Art
Post-Impressionism
Pre-Columbian Art
Pre-Raphaelites
Precisionism
Prehistoric Art
Purism
Realism
Renaissance
Rococo
Roman Art
Romanticism
Sensation Show
Social Realism
Socialist Realism
Symbolism
Ukiyo-e
Victorian Classicism
Viking Art
Vorticism

From the documents in Wikipedia describing art styles, the following pairs were extracted. These 160 pairs are used in the evaluation of the performance of the methods.

Willem de Kooning:Abstract Expressionism
Helen Frankenthaler:Abstract Expressionism
Arshile Gorky:Abstract Expressionism
Adolph Gottlieb:Abstract Expressionism
Philip Guston:Abstract Expressionism
Hans Hofmann:Abstract Expressionism
Franz Kline:Abstract Expressionism
Robert Motherwell:Abstract Expressionism
Barnett Newman:Abstract Expressionism
Jackson Pollock:Abstract Expressionism
Fuller Potter:Abstract Expressionism
Jean-Paul Riopelle:Abstract Expressionism
Mark Rothko:Abstract Expressionism
Clyfford Still:Abstract Expressionism
Jean-Baptiste Camille Corot:Barbizon School
Thodore Rousseau:Barbizon School
Jean-Francois Millet:Barbizon School
Flix Ziem:Barbizon School
Pierre Alechinsky:CoBrA
Else Alfelt:CoBrA
Karel Appel:CoBrA
Jean-Michel Atlan:CoBrA
Ejler Bille:CoBrA
Constant:CoBrA
Corneille:CoBrA
Jacques Doucet:CoBrA
William Gear:CoBrA
Stephen Gilbert:CoBrA
Henry Heerup:CoBrA
Egill Jacobsen:CoBrA
Asger Jorn:CoBrA
Lucebert:CoBrA
Jan Nieuwenhuys:CoBrA
Erik Ortvad:CoBrA
Carl-Henning Pedersen:CoBrA
Anton Rooskens:CoBrA
Raoul Ubac:CoBrA
Theo Wolvecamp:CoBrA
Georges Braque:Cubism
Pablo Picasso:Cubism
Jean Crotti:Dada and Surrealism
Theo van Doesburg:Dada and Surrealism
Marcel Duchamp:Dada and Surrealism
Max Ernst:Dada and Surrealism
Lyonel Feininger:Dada and Surrealism
George Grosz:Dada and Surrealism
Francis Picabia:Dada and Surrealism
Man Ray:Dada and Surrealism
Kurt Schwitters:Dada and Surrealism
Ren Magritte:Dada and Surrealism
Joan Mir:Dada and Surrealism

Max Ernst:Dada and Surrealism
Salvador Dal:Dada and Surrealism
Alberto Giacometti:Dada and Surrealism
Man Ray:Dada and Surrealism
Wassily Kandinsky:Der Blaue Reiter
Franz Marc:Der Blaue Reiter
August Macke:Der Blaue Reiter
Paul Klee:Der Blaue Reiter
Alexej von Jawlensky:Der Blaue Reiter
Max Beckmann:Der Blaue Reiter
Henri Matisse:Fauvism
Andr Derain:Fauvism
Maurice de Vlaminck:Fauvism
Raoul Dufy:Fauvism
Georges Rouault:Fauvism
Kees van Dongen:Fauvism
Lawren Harris:Group of Seven
Arthur Lismer:Group of Seven
Aaron Douglas:Harlem Renaissance
Lois Mailou Jones:Harlem Renaissance
Jacob Lawrence:Harlem Renaissance
Lon Bakst:Impressionism
Frdric Bazille:Impressionism
Mary Cassatt:Impressionism
Gustave Caillebotte:Impressionism
Lovis Corinth:Impressionism
Edgar Degas:Impressionism
Frederick Carl Frieseke:Impressionism
Eva Gonzals:Impressionism
Childe Hassam:Impressionism
Max Liebermann:Impressionism
Laura Muntz Lyall:Impressionism
Jacob Maris:Impressionism
Willem Maris:Impressionism
Willard Metcalf:Impressionism
Claude Monet:Impressionism
Berthe Morisot:Impressionism
Lilla Cabot Perry:Impressionism
Camille Pissarro:Impressionism
Wladyslaw Podkowiński:Impressionism
Pierre-Auguste Renoir:Impressionism
Theodore Robinson:Impressionism
Zinaida Serebryakova:Impressionism
Alfred Sisley:Impressionism
Konstantin Somov:Impressionism
John Henry Twachtman:Impressionism
J. Alden Weir:Impressionism
Konstantin Yuon:Impressionism
Carl Andre:Minimalism
Frank Stella:Minimalism
Donald Judd:Minimalism
Philip Guston:Pop Art
Richard Hamilton:Pop Art
David Hockney:Pop Art

Jasper Johns:Pop Art
Allen Jones:Pop Art
Yayoi Kusama:Pop Art
Roy Lichtenstein:Pop Art
Peter Max:Pop Art
Claes Oldenburg:Pop Art
Robert Rauschenberg:Pop Art
James Rosenquist:Pop Art
Wayne Thiebaud:Pop Art
Andy Warhol:Pop Art
Tom Wesselmann:Pop Art
Paul Czanne:Post-Impressionism
Paul Gauguin:Post-Impressionism
Henri Rousseau:Post-Impressionism
Georges Seurat:Post-Impressionism
Henri de Toulouse-Lautrec:Post-Impressionism
Vincent van Gogh:Post-Impressionism
Jos Clemente Orozco:Social Realism
Diego Rivera:Social Realism
Edward Wadsworth:Vorticism
David Bomberg:Vorticism
Wyndham Lewis:Vorticism
Ruud Janssen:Fluxus
Litsa Spathi:Fluxus
Wolf Vostell:Fluxus
Ernst Ludwig Kirchner:Die Brcke
Karl Schmidt-Rottluff:Die Brcke
Emil Nolde:Die Brcke
Max Pechstein:Die Brcke
Emil Nolde:Expressionism
Franz Marc:Expressionism
Karl Schmidt-Rottluff:Expressionism
Ernst Ludwig Kirchner:Expressionism
Max Beckmann:Expressionism
August Macke:Expressionism
Egon Schiele:Expressionism
Oskar Kokoschka:Expressionism
Wassily Kandinsky:Expressionism
James Ensor:Expressionism
Edvard Munch:Expressionism
Richard Estes:Photorealism
Robert Bechtle:Photorealism
Don Eddy:Photorealism
Richard McLean:Photorealism
El Lissitzky:Constructivism
Lszl Moholy-Nagy:Constructivism
Vladimir Tatlin:Constructivism
Albert Bierstadt:Hudson River School
Thomas Cole:Hudson River School
Thomas Doughty:Hudson River School
Martin Johnson Heade:Hudson River School
Thomas Moran:Hudson River School
El Greco:Mannerism
Parmigianino:Mannerism

Tintoretto:Mannerism

For the co-occurrences between painters, in PM we used the same patterns as used in the first experiment. For the co-occurrences between painters and art styles, the following patterns were used.

rp related: "#0 #1"
rp related: "#1 #0"
rp related: "#0 and other #1"
rp related: "#0 and #1"
rp related: "#0 tog initiativ til #1"
rp related: "#0 and the the #1"
rp related: "#0 surrealism #1"
rp related: "#0 synthetic #1"
rp related: "#1 artist #0"
rp related: "#0 express #1"
rp related: "#0 of the #1"
rp related: "#0 uit de #1"
rp related: "#0 experimenting with #1"
rp related: "#0 c #1"
rp related: "#0 arte #1"
rp related: "#1 painter #0"
rp related: "#0 his #1"
rp related: "#0 post #1"
rp related: "#0 after #1"
rp related: "#0 more on #1"
rp related: "#1 with #0"
rp related: "#1 and #0"
rp related: "#1 artists #0"
rp related: "#1 were #0"
rp related: "#1 figures #0"
rp related: "#1 is #0"
rp related: "#0 type #1"
rp related: "#1 avec #0"
rp related: "#0 made #1"
rp related: "#1 by #0"
rp related: "#1 the #0"
rp related: "#0 holland #1"
rp related: "#0's early #1"#1"
rp related: "#0's style of #1"
rp related: "#0 originated #1"
rp related: "#0 co founds the #1"
rp related: "#0 aangekocht door #1"
rp related: "#0's #1"
rp related: "#0 unveils his #1"
rp related: "#0 coinventors of #1"
rp related: "#0 creation pre #1"
rp related: "#0 and co founded the #1"
rp related: "#0 had carried #1"
rp related: "#0 was founder of #1"
rp related: "#0 de laatste #1"
rp related: "#0 in zijn #1"
rp related: "#0 the #1"
rp related: "#0 desktop wallpaper theme art #1"

rp related: "#0 founded #1"
 rp related: "#0 when did #1"
 rp related: "#0 started #1"
 rp related: "#0 from #1"
 rp related: "#0 develops #1"
 rp related: "#0 master of #1"
 rp related: "#0 de #1"
 rp related: "#0 what is #1"
 rp related: "#0 introduced #1"
 rp related: "#0 an important #1"
 rp related: "#0 webmuseum #1"
 rp related: "#0 is one of #1"
 rp related: "#0 yet #1"

3 Experimental Results

In Table 1 the performance of the preliminary mapping m' can be found for the three methods ($n = 0$) for both experiments. The experiments show that in general the use of related instances improves the classification (see Table 1 and Figure 2). It is remarkable that the methods with the lowest Google Complexity thus PM and DM perform better than PCM.

We were able to map all artists to a genre. Co-occurrences of genres and artists thus could be found using PCM, PM as well as DM. The latter performs best. With respect to the preliminary mapping, the method with the smallest amount of Google queries performs best. Moreover, DM shows that the first k pages ranked by Google indeed contain relevant and reliable information for our purposes.

Using DM, only few related artists can be found on the documents visited. This leads to a stable performance for the final mapping when expanding the list of related artists (Figures 2 and 1). That is, we only consider artists that co-occur at least once. Contrary to especially PCM, large numbers of n do not deteriorate the precision.

method	ARTIST-GENRE			PAINTER-MOVEMENT		
	$n = 0$	best (corresp. n)		$n = 0$	best (corresp. n)	
PCM	71.4	81.3	(13)	35.0	35.0	(0)
PM	72.2	88.8	(8)	53.8	63.8	(18)
DM	83.9	87.1	(5)	65.0	81.2	(20)
PM-STEMMING				53.2	61.9	(28)

Table 1. Precision (%) without related instances and best precision per method.

We can combine the results of the three methods as well. In Figures 3 and 4 the precision is given using a majority voting among DM, PM and PCM. When no consensus is reached (i.e. for each method a different category $m(b)$ was found for instance b) the $m(b)$ found by DM is chosen.

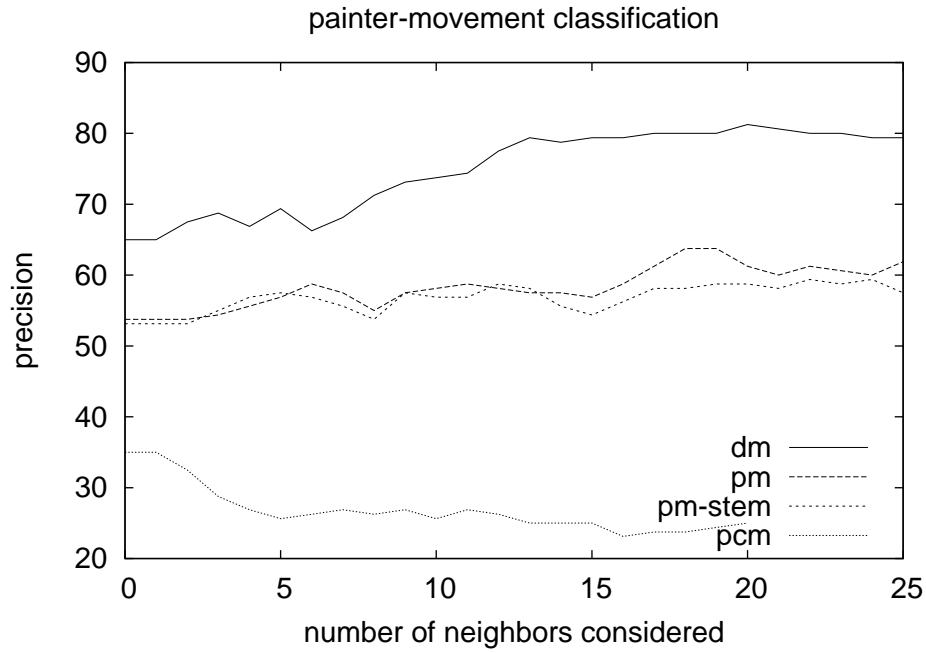


Fig. 1. Precision (%) for classification.

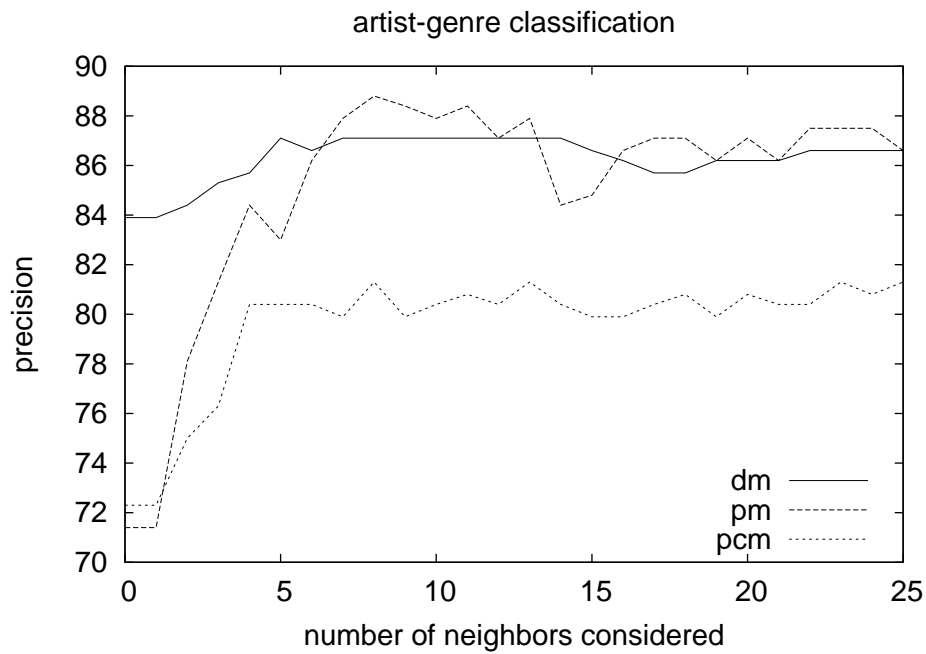


Fig. 2. Precision (%) for classification.

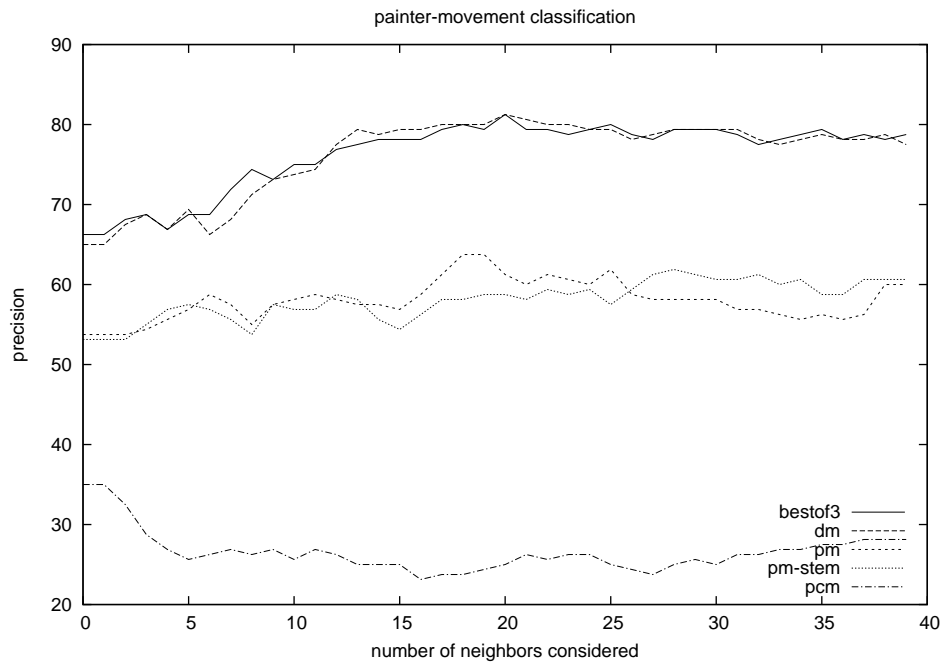


Fig. 3. Precision (%) for classification.

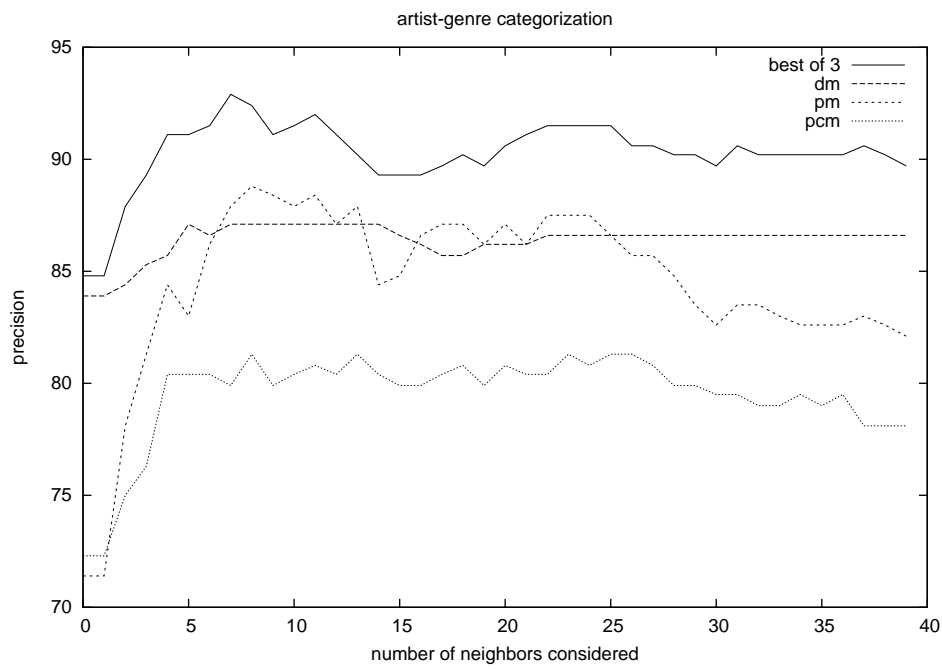


Fig. 4. Precision (%) for classification.